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THE

Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, MARCH 11, 1864. [No. 590. Vol. XII.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at 8 o'clock.

March 16.—"On the Organisation of the Corps Impérial des Ponts-et-Chaussées in France." By George R. Burnell, Esq.

March 23.—Passion week. *No meeting.*

March 30.—"Artificial Light and Materials Used for Lighting." By B. H. Paul, Esq.

Cantor Lectures.

The next lecture of Mr. Burges's course will be delivered on Monday next, at eight o'clock.

Mar. 14.—Lecture VI.—*Furniture.*—Mediæval furniture, oak and painted; Renaissance; 16th and 17th centuries; modern.

Mar. 21.—Lecture VII.—The Weaver's art; Mediæval, Eastern, modern.

Dwellings of the Labouring Classes.

The Council have passed the following resolutions:—

"That a Conference of the Society be summoned to consider the causes of the present unsatisfactory condition of the Dwellings of the Labouring Classes, and whether there are any remedies which can be advantageously adopted."

"That, besides inviting the attendance of any members of the Society taking an interest in the subject, the co-operation of such as are members of the Legislature as well as of the Presidents of the Institutions in union, be especially requested."

"That the Chairman of the Council, Lord Henry G. Lennox, M.P., Mr. Marsh, M.P., Mr. Cole, C.B., and Mr. C. Wren Hoskyns, be a committee to make the arrangements for the Conference, and to invite thereto any other persons whose presence they may think desirable."

Prizes for Art-Workmen.

The Council of the Society of Arts hereby offer prizes for Art-Workmanship, according to the following conditions:—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or if sold previous to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed, the candidates must be prepared to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bona-fide* Art-workmen only can receive prizes.

VI. All articles for competition must be sent in to the Society's house on or before Saturday, the 26th of November, 1864, and must be delivered free of all charges. Each work sent in competition for a Prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles, a description for insertion in the catalogue should be sent.

VII. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VIII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

IX. All the prizes are open to male and female competitors, and in addition, as regards painting in porcelain, decorative painting, and wall mosaics, a second set of prizes of the same amounts will be awarded among female competitors. If a female desires to compete in the female class only, she must declare her intention accordingly. The originals of the works prescribed may be seen at the South Kensington Museum, in the gallery at the entrance to the Sheepshanks pictures.

Casts may be seen at the Society of Arts, Adelphi, London, and the Schools of Art at Edinburgh, Dublin, Manchester, Glasgow, Birmingham, and Hanley in the Potteries.

Photographs, engravings, &c., may be purchased at the Society of Arts, John-street, Adelphi, at the prices named.

⁂ The Council are happy to announce that several of the works which received first prizes in the competition of 1863, have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

1st Division.

Works to be Executed from Prescribed Designs.

For the successful rendering the undermentioned designs in the various modes of workmanship according to the directions given in each case. Chromolithographs, woodcuts, photographs, and casts of such designs, will be sold at the Society's house at cost price.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—One prize of £15 for the best and a second prize of £7. 10s. for the next best work executed in marble or stone, after the Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.* Original in the South Kensington Museum, No. 5,896. Dimensions to be one-eighth less than the cast.

[Cast—Fifteen shillings. Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £10 for the best and a second Prize of £5 for the next best work executed in marble, stone, or wood after a carved chair-back in the possession of Henry Vaughan, Esq. Dimensions to be two-thirds of the cast.

[Cast—Twelve shillings. Photograph—One shilling.]

c. *Ornament.*—One Prize of £10 for the best, and a second Prize of £5 for the next best work executed in stone, after a *Gothic bracket* in the Architectural Museum Dimensions the same as the cast. In this design the details may be improved by the introduction of small animals, and the human head may be changed according to the taste of the art-workman.

[Cast—Ten shillings; Photograph—One shilling.]

(*d.*)—One prize of £20 for the best, and a second prize of £10 for the next best, work carved in *wood* after a design by *Holbein*, as an *Inkstand* or *Watch-Holder* on three feet. Diameter of body to be eight inches.

[Wood Engraving—Sixpence.]

(*e.*)—One prize of £15 for the best, and a second prize of £7 10s. for the next best, work carved in wood after the *Head of a Harp* of the period of Louis XVI., in the South Kensington Museum, No. 8531. The head and bust only need be fully completed. Dimensions the same as the cast.

[Cast—Thirty shillings; Photograph—One shilling.]

(*f.*) *Ornament.*—One prize of £10 for the best, and a second prize of £5 for the next best work carved in wood after an *Italian picture frame* in the possession of Henry Vaughan, Esq. Dimensions—Twelve inches high, sight measure.

[Photograph—One shilling.]

Class 2.—Repoussé Work in any Metal.

(*a.*) *The Human Figure as a bas-relief.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Raphael's* "*Three Graces.*" Dimensions—The figures to be six inches high.

[Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a Flemish salver in the South Kensington Museum, date about 1670, No. 1153. Dimensions—Twelve inches in diameter.

[Photograph—One shilling.]

Class 3.—Hammered Work, in Iron, Brass, or Copper.

Ornament.—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after the portion shown in the Photograph of the Pediment of a Gate (German work, date about 1700,) in the South Kensington Museum, No. 5979. To be adapted for use as a bracket. Dimensions—12 inches deep.

[Photograph—One shilling and threepence.]

Class 4.—Carving in Ivory.

(*a.*) *Human Figure in the round.*—One prize of £15 for the best and a second prize of £10 for the next best, work executed after an *Ivory*, by *Fiamingo*, in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—One Shilling.]

(*b.*) *Ornament.*—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after a pair of *Tablets*, in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—One Shilling.]

Class 5.—Chasing in Bronze.

(*a.*) *The Human Figure.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after a reduced copy of "*Clytie.*" A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society, price, 12s.

A plaster cast may be obtained from D. Brucciani, 39, Russell-street, Covent-garden, W.C., price, 3s. 6d.

(*b.*) *Ornament.*—One prize of £10 for the best and a second prize of £7 10s. for the next best, work executed after *Goutier*, from a cabinet in the possession of Her Majesty the Queen. A rough casting in bronze, on which the chasing must be executed, will be supplied by the Society. Price 2s. 6d.

[Plaster Cast—One shilling.]

Class 6.—Etching and Engraving on Metal—Niello Work.

Ornament.—One prize of £10 for the best and a second prize of £5 for the next best, work executed after arabesques by Lucas Van Leyden, 1528. No. 18,968 in the South Kensington Museum. To be engraved the height of the photograph, and, if round a cup or goblet, repeated so as to be not less than nine inches in length when stretched out.

[Photograph—Sixpence.]

Class 7.—Enamel Painting on Copper or Gold.

(*a.*) *The Human Figure.*—One prize of £10 for the best, and a second prize of £5 for the next best, work executed after *Raphael's design of the* "*Three Graces,*" executed in *grisaille.* Dimensions—The figures are to be four inches high.

[Photograph—One shilling.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a German arabesque (16th century). No. 19,003 in the South Kensington Museum. Dimensions—The same as the Engraving.

[Engraving—Sixpence.]

Class 8.—Painting on Porcelain.

(*a*) *The Human Figure.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Raphael's* "*Two Children,*" in the cartoon of "*Lystra.*" Dimensions—the same as the Photograph. This work is to be coloured according to the taste of the painter.

[Photograph—Ninepence.]

(*b.*) *Ornament.*—One prize of £5 for the best and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528, No. 18,968 in the South Kensington Museum, and coloured according to the taste of the painter. Dimensions—Double the size of the Photograph.

[Photograph—Sixpence.]

N.B.—See conditions, Section IX.

Class 9.—Decorative Painting.

(*a.*) *Ornament.*—One prize of £5 and a second prize of £3 for a work, executed after an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum, No. 1150.

[Coloured Print—One Shilling.]

(*b.*) *Ornament.*—One prize of £5 and a second prize of £3 for a work, executed after a *picture frame*, in the South Kensington Museum, No. 7820. Dimensions—5 feet by 3 feet 11½ inches, outside measure. The works to be executed on canvass, either with or without stretchers, in cool colours. Some lines of the mouldings may be gilt.

[Photograph—One shilling and sixpence.]

N.B.—See conditions, Section IX.

Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed after a specimen in the possession of the Hon. John Ashley. Dimensions—one-third larger than the Lithograph.

[Outline Lithograph—One shilling.]

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Wyon's* heads of the Queen and the Prince Consort, on the Juror's medal of 1851.

(*b*) *Animal.*—One prize of £10 for the best and a second prize of £5 for the next best, work executed after *Wyon's* "*St. George and the Dragon,*" on the Prince Consort's medal. Dimensions the same as the casts.

[Casts—Sixpence each.]

Class 12.—Engraving on Glass.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed after arabesques by Lucas Van Leyden, 1528. To be engraved the height of the engraving; and if round a glass or goblet, repeated so as to be not less than 9 inches long when stretched out.

[Engraving—Sixpence.]

Class 13.—Wall Mosaics.

Human Head.—One prize of £15 for the best and a second prize of £10 for the next best, work executed after *Bertini*, of Milan. A preparatory drawing must be made, coloured, after the lithograph, on which the lines and disposition of the Tesseræ must be marked. The dimensions of the work to be regulated by the size of the Tesseræ proposed to be used, which size may be left to the choice of the artist. Although desirable, it is not necessary to execute the whole subject in actual mosaic, but if a part only be done, the eye must be in such portion. A coloured drawing, with Tesseræ, may be seen at the Society's house, and in the South Kensington Museum, and Tesseræ of two sizes may be obtained from Messrs. Minton, Stoke-upon-Trent, and Messrs. Maw and Co., Brosely, Shropshire.

[Lithograph Outline Coloured—Two Shillings.]

N.B.—See conditions, Section IX.

Class 14.—Gem Engraving.

(*a.*) *Human head.*—One prize of £10 for the best and a second prize of £5 for the next best work executed after an original in the possession of John Webb, Esq. Dimensions—the same as the cast.

[Cast—Sixpence.]

(*b.*) *Full-length figure.*—One prize of £10 for the best and a second prize of £5 for the next best work executed after an original in the possession of John Webb. Esq. Dimensions—the same as the cast.

[Cast—Sixpence.]

Class 15.—Die Sinking.

Human head.—One prize of £10 for the best, and a second prize of £5 for the next best work executed after the head of the Prince Consort, by *Wyon*, on the Society's medal. Dimensions half the size of the original.

[Cast—Sixpence.]

Class 16.—Glass Blowing.

Ornament.—One prize of £7 10s. for the best and a second prize of £5 for the next best, work executed after an original in the South Kensington Museum, No. 1813. —Dimensions as given in the wood engraving.

[Lithograph—One shilling.]

Class 17.—Bookbinding and Leather Work.

(*a.*) *Bookbinding.*—One prize of £7 10s. for the best and a second prize of £5 for the next best work executed in bookbinding, after an Italian specimen in the South Kensington Museum, No. 7,925. The work to be bound should be some classical author of the size given. Dimensions—the same as the photograph.

[Photograph—One shilling.]

(*b.*) *Leatherwork.*—One prize of £7 10s. for the best, and a second prize of £5 for the next best work of boiled and cut leatherwork for the outside covering of a jewel casket. Original in the South Kensington Museum, No. 7768. Dimensions—one-third larger than the photograph.

[Photograph—One shilling and sixpence.]

Class 18.—Embroidery.

Ornament.—One prize of £5 for the best and a second prize of £3 for the next best, work executed either after a German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum, No. 7468, which may be adapted to a screen. Dimensions, according to the taste of the embroiderer.

[Photograph—German, Sixpence; Italian, One shilling.]

2nd Division.

Works to be Executed without Prescribed Designs.

Wood Carving.

(*a.*) *Human figure in alto or bas relief. Animals or natural foliage may be used as accessories.* 1st prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

(*b.*) *Animal or still life. Fruit, flowers, or natural foliage, may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

(By order)

P. LE NEVE FOSTER, *Secretary.*

Malta Exhibition.

The following is the letter of which a short notice only could be given in last week's *Journal*:—

Malta, Valetta, 18th February, 1864.

Sir,—As President for the time being of the Society of Arts and Commerce, established in 1862, in connection with your admirable institution, I feel it my duty to let you know, for the information of the Council, that the Society of Arts, Manufactures, and Commerce of Malta have accepted a proposition made by one of their members (Commander Strickland), and have appointed a direction for organising a general Exhibition of the Arts and Industry in these islands, with a view to their promotion and advancement.

The subject was brought under the cognisance of the Board of Trade during last summer, and was by that department strongly recommended to the notice of his grace the Secretary of State for the Colonies. The Duke of Newcastle was pleased to approve of the scheme, and caused a letter to be written to the directors, and a copy forwarded to the local government.

I have the honour to enclose you likewise the programme of our exhibition, put forward in May of last year, as well as a list of the sections into which the industry of the place has been divided, and the rules framed for guidance.

The nobles and gentry of Malta have guaranteed a sufficient sum to cover all probable expenses.

The Government having been able to grant a magnificent public hall for the exhibition to be held in, one of the greatest causes of expenditure, viz., building, is removed.

I also have the honour to enclose extracts from the local journals, in which the first general meeting of the heads of sections is reported, and which will enable your Council to judge of the reasons which the Directors of the Maltese Exhibition have to look forward to a good success.

It would conduce highly to this most desirable end, if the Council of your Society could arrange to have sent out to Malta for this Exhibition, on loan, some articles likely to be adopted by Maltese artisans, and which could improve and facilitate their works; amongst others, the Directors would be gratified to receive tools for carpenters, blacksmiths, &c.; materials used for staining and varnishing wood, planing instruments for smoothing the surface of soft stone, trowels for plastering walls, and some models of machines for cleaning cotton and preparing it for spinning.

Arrangements have been made with the P. and O. Steam Navigation Company to forward any packages directed to the Maltese Exhibition. The Directors would undertake to have all articles returned to the Society after the Exhibition is closed.

I have the honour to be, Sir, &c.,
Marquis P. Testaferrata Olivier.
To the Secretary of the Society of Arts.

P.S.—It is intended that the Exhibition should be opened about the second week of April next.

The Council have applied to the Cotton Supply Association of Manchester to contribute to this Exhibition, and they have pleasure in stating that that body has consented to forward gins for cleaning cotton of the most approved construction, and these gins are offered by the Association as prizes to the most successful growers of cotton in that district.

The Council will take steps for getting a good representation of the tools and materials referred to in the letter, and they hope that members of the Society who may be manufacturers of such articles will assist in this matter.

Proceedings of the Society.

CANTOR LECTURES.

Fine Arts Applied to Industry. By W. Burges, Esq.

Fifth Lecture, Monday, March 7.—Gold and Silver.

It appears that, although considerable documentary evidence exists as to the excellence of the antique works in gold and silver, the value of the material has caused an almost complete destruction of the objects themselves, and we have, consequently, but little to learn from this quarter; on the contrary, a comparatively large quantity of mediæval plate and jewellery has come down to our own day, to say nothing of the numerous and curious inventories so frequently met with; the most instructive of these latter being that of Louis, Count of Anjou, taken somewhere about the year 1360, and which has been published in the work of M. de Laborde, on "The Enamels in the Louvre." The various processes applied to the working of the precious metals in the middle ages were then described, and a short list given of the principal vases and ornaments demanded for the decoration of the Church and for secular uses. Much regret was expressed at the want of art education, not only among the workmen, but among the tradesmen themselves; the old silver and goldsmiths, such as Cellini, being both tradesmen and artists. The next part of the subject touched upon was jewellery. Great praise was given to the ornaments of the ancient Etruscans, which were literally "jewels of silver and jewels of gold." The higher sort of mediæval jewellery appears, on the contrary, to have consisted almost entirely of precious stones, only such an amount of metal being used as was necessary to bind them together. The jewellery of the renaissance formed a third variety, being distinguished by the little figures and ornaments covered with enamel. The lecturer then drew attention to the modern revivals of Etruscan work by Signor Castellani, of the mediæval by Messrs. Hardman and Co., and of the renaissance by Mr. Hancock and Messrs. Widdowson and Veale. Mr. Green's jewellery was also noted for the good taste generally displayed. Finally, a few words were added on the coinage and the necessity of a great improvement with regard to that in present use, the example of the Greeks being adduced, whose coins were objects of the highest art, and the dies for which are supposed to have been made by the same artists who engraved gems. The Italian money of Louis XII. was also brought forward as a most excellent example, exhibiting, in its way, nearly as good art as the Greek coins, while it possessed the great advantage of being easily piled—the want which, in the present day, would be considered a great defect in the antique examples. The lecture was illustrated by some very excellent examples of plate and jewellery. Thus Mr. Eastwood contributed some choice specimens of Etruscan and Anglo-Saxon jewels—among the former was a bracelet, which contained beads frosted with minute gold dust. Mr. Boore contributed some curious ancient chalices. Mr. Green sent a case of very exquisite modern jewellery, and Messrs. Hardman and Co. of modern mediæval, while the display of diamonds and precious stones was due to the courtesy of Messrs. Widdowson and Veale, and of Mr. Lambert, the latter of whom was a most liberal contributor of 16th and 17th century plate, among which a figure of Vulcan (in silver) demands special notice. Mr. Pairpoint lent two excellent bossed-up figure medallions, and several other beautiful works in silver were contributed by Messrs. Elkington and Co.

Thirteenth Ordinary Meeting.

Wednesday, March 9th, 1864; Samuel Gurney, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Barber, Thomas Archer, 2, Scott's-place, Lower-road, Islington.
Cheesewright, Charles, Alma-terrace, Highbury, N.
Hales, Edward, Dover.
Salt, Thomas Partridge, Ashton-villa, Moseley, Birmingham.
Slee, Edward, Church-street, Horselydown, S.E., and Clapham-park, S.

The Paper read was—

ON FISH HATCHING.

By Frank Buckland, M.A., M.R.C.S., F.Z.S.

It is with very great pleasure I avail myself of this opportunity of addressing you on the subject of the artificial breeding of fish, and I trust that when you have heard what I have got to tell you, you will agree that it is one of the most practical applications of the study of natural history that has been brought to notice of late years. The mode of hatching valuable fish, such as the trout and salmon, by artificial means, is no longer an experiment. It has, I have been pleased to see, been lately gazetted by public consent to the rank of science, which is every year attracting more and more attention. I shall not weary you by entering into the history of the art, suffice it to say, that the first discoverers were two poor French fishermen, Gehin and Remy—all honour to their names for the great good they have done to their fellow creatures.

You will find in books a statement repeated over and over again—a fault very common in treatises on natural history—that the Chinese were the first to practice pisciculture, but let me tell you what their pisciculture consists of. They have no idea (I have it from the best authority, viz., of officers in the army who have travelled there) of hatching fish in troughs, such as we see in European establishments, nor have they yet arrived at the practice of impregnating the eggs artificially. What they do is this:—they observe the spawn of fish, as you yourself may also do this spring in the Thames, hanging about the bushes, having been placed there by the fish themselves; they collect this spawn, hang it up in tubs and ponds, and let it hatch out of itself; but though they have not the science that we have, yet they are pisciculturists in a most practical manner, for I have it on the authority of an eyewitness, that when the Chinese flood their paddy or rice fields, with water, they turn out into these flooded fields large numbers of fish, which feed upon the worms, insects, &c., which they find in the mud, and this without injury but rather benefit to the plants themselves. When the fields have had enough water the Chinese water-farmer opens the hatchways, catches what fish are fat enough, and sends them to market; the others he lets out into another fresh-flooded paddy field for another pasture. In fact, the Chinese herd their fish and drive them from one pasture to another, just as a shepherd drives his sheep from one turnip field to another. These fish are, I believe, great, coarse things, and appear something between a chub and a tench. There are, I believe, no representatives of the Salmonidæ in China.

Leaving the history of the subject at this point, I would now proceed to the practice of the art. There may be some who say why not let the fish breed for themselves? Doubtless, if left alone in a perfect natural state, they would multiply themselves to an enormous extent, as is the case, I am told, at Petropaulouski, where the salmon are occasionally left high and dry by the subsiding of the floods, and such numbers of them perish in this way as to cause a plague by the putrefaction of their bodies.

When we consider the vast number of eggs which nature has given to fish, it is a wonder, indeed, that all the world is not fish.

The *eggs* of fish are simply the hard roe of fish; and if you examine the next red herring for breakfast you will find that the hard roe is composed of a large number of little balls, each of which might possibly come to a fish. You will find in books on natural history the number of eggs in fish. Not trusting altogether to these statements, I have been at some considerable pains to count the eggs* of the following fish. To begin with the salmon, these fish carry about 1,000 eggs to a pound of their weight, so if we can get a fish weighing twenty-five pounds we have no less than 25,000 eggs, that is to say, about as many eggs as persons composing the population of the city of Oxford.

The trout also, like the salmon, gives 1,000 eggs to every pound of her weight; the following table will give you some idea of the powers of multiplication in fish:—

	Weight of fish.	Total number of eggs.	Value if they *all* became marketable fish.
Salmon ...	20 ℔. at 2s. per ℔.	20,000	£40,000
Trout	1 ℔.	1,008	
Jack	4½ ℔.	42,840	
Perch	½ ℔.	20,592	
Roach	¾ ℔.	480,480	
Smelt	2 oz.	36,652	
Lump Fish.	2 ℔.	116,640	
Brill	4 ℔.	239,775	
Sole	1 ℔.	134,466	
Herring ...	½ ℔.	19,840	
Mackerel ...	1 ℔.	86,120	
Turbot......	8 ℔. at 5s. each...	385,200	£96,300
Cod	20 ℔.	4,872,000	
Sturgeon ...	4 cwt.	Three buckets and a half of caviare.	
Oyster		1,500,000 at 1d. each	£6,250

Salmon, at Worcester, are now selling at four shillings a pound. If, therefore, a female salmon, weighing 20lbs. deposited her eggs in some safe place, and they all eventually became marketable fish, which would be in three or four years' time, we should find that the eggs of this one salmon would yield no less than 178 tons 11 cwt. of salmon fit for food; and supposing we put this down at 2s. per lb., it would be worth £40,000, and at the present price at Worcester, 4s. per lb., the product of this veritable golden fish would be worth £80,000. Even supposing only a quarter of the young fish ever became marketable, still this one fish would yield a value of £10,000, and all without costing any human being a halfpenny for food.

It may be asked, therefore, what becomes of all the eggs of the salmon, trout, &c.? The same thing that happens to the common fowl eggs happens to the fish. In the case of the fowl, we ourselves eat many thousands of eggs, and we know how good they are for various culinary purposes; and as in the case of the fowl, so also with the fish eggs; there are enemies innumerable who seek to destroy them; even the water itself is occasionally antagonistic to their well-being.

First of all, then, many of the fish's eggs do not get at all impregnated, or, not becoming properly buried in the gravel, are washed away by the stream. In proof of this I would mention the following:—There are no good spawning places in the Thames; the fish—and the Thames trout are really fine fish—are therefore obliged to deposit their eggs in the rapids in the centre of the stream. Some of the nests where trout had been actually seen to deposit their eggs have lately been carefully examined, and not a single egg could be found—they had all been carried away by the stream, or devoured by insects, of which thousands were found in the nest. A friend, writing from Hampshire, says that he has examined the nests where the salmon have been seen to spawn, but no eggs could be found. Even supposing the eggs have been properly deposited in the nests, down come the floods and overwhelm the place. Thus, my friend Mr. T. Ashworth informs me that at the beginning of the season over 275,000 eggs were taken from salmon and placed in his hatching boxes. Immediately after this was done down came the floods, and of the eggs which had been exposed to their violence hardly one could have survived. Then again, we have the reverse of floods, *i.e.*, the droughts, which leave the eggs exposed; or, as it happens in Hampshire, the fish lay their eggs in what is called "the drawings," the water is let off them, and the eggs, of course, perish. Fish, again, are great enemies to their own eggs. I have frequently seen myself two or three small trout hiding behind the nest, and as the female deposits her eggs, swim after and eat them up as they go along in the stream. Trout have also been often observed with their tails in the air robbing the nests. Even females will eat their own eggs. What wonder then that trout should be so scarce when both father and mother devour their offspring. I myself have frequently taken eggs which they had stolen from the spawning-beds, from the maws of trout, and my friend Mr. Ashworth tells me that he has actually hatched out 500 eggs taken from the mouth of one fish robber.

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* The way to count the eggs is this:—Make a few cuts with a knife in the membrane which contains the roe, and then plunge them into water which is, at the moment of immersion, positively at the boiling point; being composed of albumen, the eggs obey the natural law and coagulate in an instant, then add a little common salt, and continue to boil the eggs, till they all become quite detached from the membrane and swim about in the water, loose like marbles; if any adhere to the membrane they should be gently removed by a short brush, or by shaking in the boiling water. I then, when all the eggs are quite loose, pour off the water and pour the eggs into a meat dish, drying them slowly either in the sun or in the oven, the door of which is left open to prevent their becoming baked into lumps. I then weigh the whole mass of the eggs, and put down the total weight on paper. I then weigh out five grains from the mass, and get them counted over carefully under a magnifying hand-glass, on white paper; this is ladies' work.

Supposing the eggs to have been properly laid in their nests, they become the prey of pests innumerable. The larva of the may-fly and the dragon-fly (justly called the river tiger) act the same part to the fish eggs in the water as do the hedgehogs and other vermin to the pheasant eggs on land.

The common water shrimp also has been accused of eating the eggs of fish, but I am beginning to think, from experiments I have made, that he is harmless, and purely a vegetable feeder. The Caddis worm has also been accused of eating trout eggs, but Miss Smee, the daughter of Mr. Alfred Smee, surgeon to the Bank of England, has tried experiments with the Caddis worm. Causing them to build their houses with coloured glass, amethyst, gold, silver, brass, &c., Miss Smee gave her Caddis worms some trout eggs, to see what they would do; they did not attempt to eat them, but simply made use of them to build their houses. Curious sight it must have been to see a Caddis in a house made of fish eggs.

Among birds the eggs have many enemies as well as friends. The chief of the former are common ducks, which, with their spade-like bills, soon get all the eggs out of their nests and devour them. The swans, though very graceful ornaments in a pond, do a deal of mischief to the fish, especially in the Thames. Two birds, the water ouzel and dabchick, have been accused as poachers after fish eggs.

I have examined the crops of several of these birds, and have invariably found them to contain the remains of insects, but no fish eggs. This matter was fully discussed at the Zoological Society, and the verdict first arrived at was "not proven," and on second consideration the water ousel was "fully acquitted from the charge of eating spawn." True it is he is ever feeding upon the spawning beds; he goes there to eat the insects that are devouring the eggs, but he does not touch them himself at all, and to accuse the bird of this fault upon mere circumstantial evidence, is about as good logic as to accuse a swallow—seen flying over a turnip field for the purpose of catching the turnip flies—of eating the turnips.

The moor hens, however, I am pretty well sure, will eat the eggs of the fish; a good observer tells me that one morning the moor hens got to his hatching boxes and cleared all the eggs out of them. There is another bird which does a great deal of harm to the fish hatcher. The Earl of Mountcharles hatched several fish last year, and placed them in a brook running through his garden, and though the trout were continually looked after they rapidly disappeared; another friend also writes to me to say that he has killed several kingfishers under the wires where his fish were confined. Herons also are terribly destructive to the fish in the spawning beds.

We have seen what becomes of the fish's eggs if they are left to themselves. It is necessary, therefore, for man to interfere, and take the eggs from the fish and keep them under his charge. In all matters of interference with nature we cannot do better than take nature herself as a guide. We observe the fish makes her nest of her own accord in a rapid, shallow, and gravelly stream. We therefore must put the eggs in an artificial nest where the following requisites are present—a stream more or less rapid—gravel—darkness—and perfect quiet. This stream must be allowed to run over the eggs perpetually, day and night, until the young fish are hatched out, just as it would do in the brook.

At the piscicultural establishment at Huningue, in France, the eggs are placed upon glass rods, such as I now show you, during the time of incubation. I would, however, most humbly beg to differ from the great authorities who use the glass bars, for, in the first place, the fish do not find glass bars at the bottom of the water to deposit their eggs, but they always find gravel; in the second, it is absolutely necessary that the egg should be perfectly motionless for some 35 or 40 days. If you place a round egg against two glass bars which are also round, the whole being under water, you at once get the best possible conditions for motion of the egg on the glass bar at the slightest touch, and you certainly do not get what you chiefly want—perfect immobility—for if the water be turned on from the tap a little too hard; or you happen to touch one egg with a camel hair brush, all the eggs in the box immediately run against each other and begin to dance and roll about. Again, when the young fish begin to hatch out, their umbilical bags very often get caught between the bars, and then they perish; or if they fall through, they get into water which is much too deep for them, and whence it is very difficult to extract them without disturbing every egg in the box. This is done in the French plan, by taking a cork out and letting the water run off from under the bars.

By placing the eggs *on gravel*, on the contrary, as you see in the boxes before you, all this difficulty is obviated. The eggs can be placed so that they do not touch one another, so that the dead ones do not contaminate their live neighbours, and may be easily picked out by the ingenious pair of forceps which I have now in my hand, so that the inequalities of the gravel will keep them perfectly steady, so that the young fish when coming out of the egg—like the young snake casting his skin in a furze bush—may have facilities afforded him to get rid of his shell, and be not like his neighbour on glass bars, who slips about thereon like a clumsy skater upon well-swept ice.

You will observe, of course, when you examine the fish-hatching boxes now in the room, that we do not in one respect adhere to nature, that is, we do not cover the eggs with gravel, as does the parent fish. The only reason why the parent fish buries her eggs is because of the light, which is unfavourable. All roots and seeds of plants, we may observe, are buried in the ground; it would appear, therefore, that at first darkness is absolutely necessary for the development of the first germs of life. Again, if the eggs are exposed to the light, a nasty white fungus immediately appears upon them. All this is obviated in a moment by placing wooden covers on the boxes, for these keep out all the light, and obviate all the inconveniences of bringing the eggs where you cannot see them, and cannot watch their progress.

Apparatus.

Now, there are two kinds of hatching apparatus which may be used—one out of doors for carrying out operations on a large scale, and the other for use on a smaller scale in-doors.

I far prefer the indoor apparatus, which is very simple in construction, more certain of success, cleaner, neater, and at the same time affords the great pleasure to the owner of being able to observe the progress of the eggs. The slate boxes on the table are those used by my friend Mr. Ponder, at Hampton, in which he has hatched so many thousands of fish, paying for the boxes out of his own pocket, and giving his time gratuitously for the Thames Angling Preservation Society; they are 3 feet long and 3½ inches deep; they should be placed one above the other, after the manner of the steps of a staircase, and so arranged that the water runs through them all in a zigzag manner; some gravel, about the size of peas, must be obtained from a gravel pit, not the river side; it must be boiled well to destroy all the seeds of vegetation, be washed perfectly clean, and then placed in the troughs, so that there should be an inch of gravel, an inch of water, and an inch above the water; place in the eggs—put on the wooden covers—see that the stream runs properly, and leave them entirely alone in the 26 boxes. Such as these have this year, at Hampton, hatched out and are still hatching out no less than 124,700 fish and eggs.

Whereas, it requires a large number of eggs to fill these boxes, and there are many private gentlemen who wish to hatch a few eggs, say about 5,000 or 10,000, Mr. King, the aquarium naturalist, of 190, Great Portland-street, has devised, with myself, the troughs which you now see upon the table in full operation. He calls them the rustic pottery troughs; and as you see, they are easily fitted upon a stand, after the manner of a geranium stand.* Besides looking neat and ornamental, they can in the summer be used as flower-pots. They are, too, very suitable for hatching fish in London houses. All that is requisite is a gentle and incessant flow of water, and what is water enough for one trough is, as a matter of necessity, enough for half-a-dozen or so. In London houses the supply of water is often limited; it is a comfort, therefore, to know that the same water can be used again twice or three times. In my own small front kitchen, at 156, Albany-street, Regent's-park, for instance, I have utilised an old regimental hospital bath, which I fill when the water comes in of an afternoon. The water will not last me nearly all day, so it is conveyed out into the area, runs through a second lot of troughs placed along the area wall, then into two large common tubs; when the bath gets nearly empty, my servant boy pumps all the water back again, by means of a hydropult,† a most useful instrument, almost indispensable to a person who wishes to hatch fish in any locality where the water supply is limited. I can only say that I shall only be too delighted to let any one interested in the subject see my apparatus; it shows how much can be done by the simplest means.

If you wish to hatch your fish in boxes out of doors, you must adopt the same principle as that applied to in-door boxes, recollecting the requisites—a clear running stream, clean gravel, and darkness. Full details of both in-door and out-door apparatus, and also the proper mode of working them, can be found in my little book.‡ Both modes of operation can, at this moment, be seen in full operation—the one at Mr. Ponder's house, Elm-grove, Hampton; the other at the Christian Spring, in the village at Hampton; and both of these sets of boxes Mr. Ponder will, I am sure, be glad to show to any of my audience. At Twickenham, the Acclimatisation Society have also erected an apparatus, which is now in full work; Mr. Francis Francis, who has full charge of this establishment, will, I am convinced, be pleased to show his mode of operation to visitors. These two societies, I would venture here to remark, at Hampton and at Twickenham, are by no means in opposition to each other. The Thames Angling Society hatch fish for the Thames only; the Acclimatisation Society for the distribution of eggs and young fish at a price, to those who wish to re-stock their waters.

The eggs having been placed in the boxes and left totally undisturbed, in course of time the eyes of the young fish will be seen like two black spots in the egg. The time required for this appearance to exhibit itself depends entirely on the temperature.

The proper temperature* of the water, both in and out of doors, ought to range from 40° to 50°. Mr. Ponder's observations tell him that at this temperature it requires thirty-five days for the eyes to appear (*i.e.*, that the fish is formed in the eye), and that they hatch out fourteen days afterwards; the same result has been obtained by him for two seasons following, with very little variation. Again, he has observed that when the temperature was 50° (in the spring of the year) the eyes of the fish were visible in twenty-six days, and that he hatched them out in ten days afterwards. Lay it down, however, for an axiom that the higher the temperature for the egg the weaker the fish produced from the egg; anything above 50° is weakening.

The first fish hatched out from a batch are the weakest, the last are the healthiest; when, however, they once begin to hatch they will come out all in a mass, two, three, or four thousand of a morning. The proper temperature for trout and salmon eggs is 40° to 50°, and again I repeat it, anything over 50° is weakening.

Grayling, however, appear to be an exception to this rule. Mr. Ponder has obtained a fair supply of the ova of these fish, which the Thames Angling Preservation Society are introducing in the Thames. The quantity obtained amounted to between fifteen and twenty thousand, and though several of these died, for they are most delicate things to carry, the remainder did very well; they are much more delicate than trout ova, both in appearance and hatching, and seem to die at the least provocation; they are beautifully transparent, and, when viewed in the sun, of a lovely opalescent hue. He has discovered about these a most interesting, and, I believe, a novel fact. The body of the fish is perfectly visible in nine days, and the fish will actually hatch out of the egg in fourteen days.

All difficulties and trouble with the eggs having been overcome, we are at length rewarded by seeing the young fish begin to come out of the egg; at this time the tail of the fish may be observed moving from side to side with a rapid vibratory movement inside the egg. The young fish, when hatched, increase in size daily, and the darkening of the transparent substance which would eventually be the body, and the development of the fins, have already proved one fact, and this (as the question has frequently been put to me) I shall venture now to mention. The eggs do not grow—*i.e.*, they do not increase in circumference or in diameter—but the fish inside the egg most certainly increases in bulk, till at last it becomes so large that the egg-shell suddenly bursts, and out comes the young fish.

I have never yet seen a more beautiful sight than the gradual development of the young salmon and trout. We begin with a globule of albumen (or white of egg); we see within it a faint line, and two black spots; day by day these become larger, till the young fish is born. Time goes on; the umbilical vesicle is absorbed, the colour appears on the scales, the long single crests, which one observes at birth as running down the upper and lower parts of the body, resolve themselves, as it were by magic, into the various fins distinctive of the adult creature, and we have a perfect fish before us. Nature, ever wonderful in her works, surpasses herself in the beauty and minuteness of the finish of the little fish.

It is most interesting to watch an egg at the moment of hatching. If you have luck you might happen to be gazing on a particular egg, when of a sudden you will see it split in twain, at the part corresponding with the back of the fish; you will then see a tiny head with black eyes and a long tail pop out, and you will see the new-born creature give several convulsive shudders in his attempts to free himself from the now useless shell. Poor little fellow! he can't manage to get out—the shell is too tight for him. Take, therefore, a soft hair pencil, press lightly on the egg-shell—he seems to know you are his friend—he gives another vigorous kick or two, and presto! he is free, and has commenced life. If we judge from his motions, he must enjoy life, for away he swims, as fast as his tiny and wriggling tail will carry him, round and round in a circle, and then plump down he goes to the bottom of the tank, and reclines on his side, breathing freely with his gills for the first time in his life.

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* The set of boxes now exhibited will be placed in the Royal Horticultural Gardens, South Kensington, in the course of the week.

† Mr. Button, maker, 27, Leadenhall-street.

‡ Fish-hatching. Tinsley Brothers, Catherine-street, Strand. Price 5s.

* I here quote from my book.

It would appear that it is not possible for the fish to remain long enough in the egg to come out ready to eat food at once, as is the case with ovo-viviparous creatures. They have, therefore, attached to their belly a bag, which contains the nourishment which the young fish must absorb into their system before they are able to shift for themselves. The moment the contents of the bag are gone, they at once begin to feed with the mouth.

In various creatures the progress of development is different. Thus, for instance, in the human baby, the first portion of the body developed is the lower jaw, and this for an obvious reason, because the most material want of the baby is to obtain the mother's milk by suction. Now, if the lower jaw were not solid and firm, in vain would it try to suck.

Now, in the case of the fish, nature has kindly packed up all the nourishment that it will want for some six or eight weeks in a neat little bag or parcel, which she has affixed to the body of the fish in such a manner that it shall be absorbed into the general system; the fish does not suck milk like a warm-blooded animal, as its lower jaw is not developed.

What is, then, the most important organ to the young fish? He has numerous enemies, and it is his first object to get out of their way. The eyes, therefore, are the organs which first arrive at perfection, and they are indeed perfection in this minute, jelly-like creature. The eye is in perfect working order at the moment of birth, though the rest of the body is far from complete.

It has long been supposed that there was a duct or tube which conveyed the nourishment from the bag to the body of the fish. My friend, Mr. H. B. Hancock, has carefully examined on this point. He reports as follows:—

"On examining into the course of circulation I find that the blood is conveyed from the heart (which is visible just under the gills of the fish) into the liver by a branch of the large trunk artery, which, after giving out branches to the intermediate spaces between the ribs, to the kidneys, &c., is finally lost in the muscular fibre of the tail; that from the liver, part proceeds from the large vein straight to the heart; the remainder, after ramifying over the umbilical vesicle of the fish, is finally collected in the large vein (*inferior vena cava*?) bordering the front part of the vescicle and returned to the heart, taking with it a portion of the contents of the vesicle received by absorption, which, being transmitted to the liver, is there assimilated, and again conveyed to the heart by the large vein for circulation in the body of the fish."

One of my many visitors to the tanks at the *Field* office, where I exhibited the process last year, was narrating to me how he once caught an enormous salmon in the Tay, weighing some thirty odd pounds; this immediately put the idea into my head to weigh one of my salmon. He has, poor little wretch, a deal of way to make up before he arrives at thirty pounds, for at present (four days old) he hardly turns the scale at two grains.

By the kindness of Mr. Ashworth, of Cheadle, near Manchester, I am enabled to show you a drawing of the young fish who weighs about two grains, and about two days old. He has also given the following observations as regards the increase of weight in the young salmon:—The fry at three days old is about two grains in weight; at sixteen months old it has increased to two ounces, or 410 times its first weight; at twenty months old, after the smelt has been in the sea, it has become a grilse of eight and a half pounds; it has increased sixteen times in three or four months; at two years and eight months old it becomes a salmon of twelve to fifteen pounds in weight; after which its increased weight of growth has not been ascertained, but by the time it becomes thirty pounds in weight it has increased to 115,200 times the weight it was at first.

Among the numerous families which fishes bear, it could hardly be expected that all of them would be straight-limbed and healthy; we find, therefore, occasionally, but not very commonly, crippled and deformed fish. Thus I show you, this evening, diagrams and living specimens of a fish of a corkscrew shape, also of a fish with four eyes and one head, also of a salmon and of a charr with two heads and one body. I take the greatest care of these fish and trust they will live, and should they be caught hereafter by any angler they would astonish him.

As regards the practical treatment of the young fish, and the question as to when they should be turned out into the stream, as well as many other points, I would like to mention if time and space would permit. I must beg to refer again to my little book on Fish-Hatching Experiments.

Having had now two years' practical experience in hatching fish, I bethought me whether this year I could not somewhat add to the science of the matter, and have, therefore, instituted several experiments as regarded the duration of the vitality of the milt and ova, whether kept separate in bottles, or taken from dead fish. This, I am convinced, is a most important point, and it may possibly lead to many practical results. The first experiment which I tried was with a fish found dead in the river, having been killed by a heron, and which had probably been dead 24 hours. The eggs, which I impregnated with fresh milt, are now in my boxes, and very few of them have died.

I have also tried a series of experiments as regards keeping the milt and ova separate in bottles from times varying from 10 minutes up to 68 hours. The results hitherto have been favourable, but I cannot be certain that fish will hatch out of these eggs. Should, however, the experiment succeed, the important practical bearing of this will at once be perceptible. Thus, for instance I impregnated, at Worcester, some salmon ova fresh from the fish with trout milt, which had been 68 hours in a bottle, but very few of these eggs are as yet dead. Again, I brought some salmon eggs from Worcester, and impregnated them with fresh trout milt at Mr. Samuel Gurney's, Carshalton. The eggs in this case were 29 hours old. I here beg to thank Mr. Gurney for his great kindness and liberality in placing his trout at my disposal for experimental purposes.

It is generally a difficult matter to get the eggs, whether of trout or salmon, properly operated upon, and then sent from a distance to the hatching boxes; it, therefore, occurred to me that if I could possibly get the eggs from dead fish to hatch out equally as well as from live fish, it would save a great deal of time, great expense, as well as trouble. Fish, therefore, have been sent up to me by Mr. J. B. Bruce, of Woolston Lodge, Faringdon, and also from Mr. Gurney's, dead, packed in wet moss, and I have taken the eggs from them at 12 hours, 24 hours, and 80 hours. It is almost impossible to tell, from any test that I know of, whether these eggs have been properly impregnated. Time alone will prove this. If the experiment succeed, we shall be able to write to our friends in the extreme north of Scotland, or the furthermost part of Ireland, and ask them to catch the fish and send them to London, where they can be operated upon, just as well as though an express messenger had been sent many hundred miles to do it.

Those who have experienced the sad disappointments that I have with eggs sent even from short distances, supposed to have been properly operated on, which arrive quite hard, white, and opaque, and, of course, dead (the cause of this being generally the shaking of the railway or other form of bad packing), can appreciate the immense advantage of operating on dead fish. Now, if we never unpack the eggs at all, and leave them as nature has herself arranged, then we shall—and I think you will agree with me—have more chance of success than by the clumsy attempts of human hands to send them in a tin or glass carrier. The only objection to the plan is, that the parent fish are of a necessity destroyed, which is not the case when they are operated on in the usual manner.

I have often been asked if operating on fish and taking their eggs from them killed them?—My answer is—that we have this year taken over one hundred thousand trout eggs, and have not killed, to my knowledge, one single fish, male or female. Those gentlemen, therefore, who have been good enough to allow us to operate on their fish,* whether salmon or trout, need not be in the least fear that any injury has been done to the fish, who, for aught I know to the contrary, may really feel much obliged to us for the trouble we have saved them in making their own nests and depositing their eggs on their own account.

It has been objected by some that these experiments with dead fish, and with milt and ova taken from fish, and kept separate many hours, have been tried before. In the *Field* of Feb. 27, 1864, "the Chronicler" quotes from M. Coste, the eminent and learned professor of embriology in the Collège de France, a statement that milt wlil remain alive for 24 hours. I have, however, carried my experiments further on this point, and have ascertained, through the kindness of my friend, Mr. H. B. Hancock, that the spermatozoa in the fish would live for so long a period as 141 hours, that is to say, six days all but three hours. It must, however, be remarked that both M. Coste and myself have separately come to the same conclusion, viz., that water must not be added to the dead fish till the moment that it is required for use, for it appears that the spermatozoa assume their peculiar vibratory quick action when water is added to them, otherwise they are quite quiescent. This is a most important point as regards the actual bringing the theory into practice.

I here desire to state, once for all, as I wish every one to remember, that I do not say that my experiment in keeping the milt and ova separate for so long a time will succeed, and that healthy young fish come from the egg, nor again am I at all sure that fish will hatch from eggs taken from the dead fish, but there is, however, no reason why the experiment should not be tried, for nature has many choice secrets in her laboratory which she has yet withheld from us, and which she will only disclose to us by asking her in the form of experiments, varied and repeated in every possible manner

PROGRESS, AND WHAT REMAINS TO BE DONE.

Thus far I have attempted to show what becomes of the eggs of the fish in their natural state; how they may be taken care of, and what great results may be, with good luck and careful management, obtained. I would venture now to report progress and the result.

The first originators and supporters of the important science of fish hatching for the public good were the French Government, who, with that liberality which encourages any private efforts for the public good, have, as most of you are aware, erected a magnificent series of buildings, which may be fairly denominated a fish manufactory, at Huningue, near Basle.

With the energetic and talented engineer of this establishment, my friend M. Coumes, I am proud to say I am personally well acquainted, and through his liberality I am now enabled to show a series of photographs of this beautiful establishment. The results obtained are somewhat stupendous. By the kindness of M. Coumes, from whom I have just received the latest news, I am enabled to give the following tables of fishes' eggs laid down in the troughs, and for particulars would refer to the official report, "Notice Historique sur l'Etablissement de Pisciculture de Huningue."*

Rhine Salmon. Great Lake Trout. Common Trout. Salmon Trout. Ombre Chevalier.		Pera or Lavaret.		Danube Salmon.		Ombre Commun.	
1854-5...	1,724,700	1854-5...	2,687,000	1855...	142,000	1855...	112,000
1855-6...	1,124,500	1855-6...	560,000	1856 ..	241,649	1856...	369,500
1856-7...	2,784,030	1856-7...	2,471,000	1857...	257,900	1857...	105,450
1857-8...	3,149,843	1857-8...	3,573,500	1858...	80,600	1858...	64,750
1858-9...	4,531,700	1858 9...	4,590,000	1859...	30,000	1859...	57,000
1859-60.	4,282,800	1859-60.	3,859,000	1860...	114,000	1860...	325,000
1860-1...	5,729,100	1860-1...	8,997,000	1861. .	43,500	1861...	1,028,000
1861-2...	6,382,900	1861-2...	11,995,000	1862...	66,000	1862...	444,000
1862-3...	4,408,000	1862-3...	18,130,000	1863...	*	1863...	*
1863-4...	7,163,680	1863-4...	8,760,000				
In 10 years	41,281,253	In 10 years	65,622,500	In 8 years	975,649	In 8 years	2,505,700

Grand Total 110,738,102

* The number of Danube Salmon and Ombre Commun, in 1863, together, were 353,000.

For particulars as to the number of deaths, &c., I would refer to the published report above-mentioned. Over 50 per cent. in the 10 years of these eggs were distributed and hatched out.

Besides these, large numbers of young fish are distributed *after* they have absorbed the umbilical bag, and are fit to be turned out to shift for themselves. M. Coumes' report shows that in 1862, 97,400 trout, salmon trout, and ombre chevalier were distributed; in 1863, of Danube salmon and ombre commun, 61,000; in 1862, 18,500; in 1863, 5,000.

M. Coumes, in his letter to me from Strasbourg, dated March 5, 1864, desires me to announce "that the French Government have just instituted a commission (which apparently corresponds to our fisheries commissions) for the purpose of drawing up laws and regulations relative to the salmon and trout fisheries in France, and to procure for the fish a free passage in the rivers, and also to determine uniformly through the empire what engines for the purpose of taking fish may be lawful and what illegal." This is a great and important step in the right direction.

Through the liberality of the French government, many thousands of the eggs of salmon, trout, &c., nearly ready to hatch, have been distributed all this year and last year throughout England. Some of these very fish are now in the boxes before you. These distributions are made gratuitously to the inhabitants of both France and England alike, the only stipulation made being that those who shall receive the eggs shall duly and properly return the forms of what I may call "births and deaths."

I hope and trust that the day is not far distant when our own Government will see the importance of founding a similar establishment for the public good.

I must now mention what has been done in her Majesty's dominions. The first place established (that I know of) was at Perth, where thousands of salmon are hatched by artificial means annually. In Mr. W. Brown's admirable little book† will be found details as to the number of eggs laid down, &c. One of the consequences of this artificial hatching, Mr. Brown informs us, is as follows:—"We find that in the year 1828, the year of the passing of Home Drummond's Act, the rental of the salmon fisheries of the Tay was £14,574. It gradually fell off every year afterwards till 1852, when it reached the minimum, amounting to £7,973 5s. In 1853 the artificial rearing commenced; and in 1858, when the statement was printed, the rental was £11,487 2s. 5d.; it has now reached what it was in 1828." Mr. Brown has been kind enough to send me the latest news as follows:—

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* There is a special clause in the Act of Parliament which does away with the illegality of taking spawning fish with the net for the *bona fide* purpose of taking their eggs for the purposes of pisciculture.

* Strasbourg, Imprimerie de Venice Berger Levanlt, 1862.

† The Stormontfield Experiment on the Salmon. Glasgow: Murray and Son. London: Arthur Hall, Virtue and Co. Price 3s.

"The number of ova deposited in the boxes at Stormontfield in November and December, 1862, was about two hundred and fifty thousand; in 1863 (last spawning) about eighty thousand. The reason that so few eggs were got during the last spawning season was the unfavourable state of the river for netting operations. There never was such a good show in the rearing pond since the commencement of the experiment as there is this year. Peter Marshall, the keeper, says that he has lost almost none since the hatching of the ova of 1862, and the rearing pond is at present swarming with young fry, the half of which will, as usual, become smoults in May next. None of the ova of November last have hatched as yet, the low temperature of this winter will retard them for a fortnight past the usual time.

"Croft College, Perth, 8th March, 1864."

Secondly. One of the greatest results in practical fish-hatching has been obtained by my friend Mr. Thomas Ashworth, and his brother, for they have actually peopled with salmon Loch Mask and Corrib, an area of lakes containing thirty-five acres of water. In 1861, Mr. Ashworth laid down 659,000 salmon eggs, he being, in his own words, "confident that he could breed salmon much easier than lambs." In December, 1862, he deposited no less than 770,000 salmon eggs, making in the two years 1,429,000. Mr. Ashworth tells me that the total cost of doing this has been exceedingly small. In order that the public may understand what a vast number of fish 770,000 would be, I would mention that it has been calculated by "the chronicler," Mr. James Lowe, that the number of human beings assembled to welcome the arrival of the Princess of Wales was 700,000—imagine a salmon for each human being—and you will have an idea of the number of fish Mr. Ashworth has hatched out as a stock for his fisheries. This year Mr. Ashworth informs me he has deposited 320,000 over and above Loch Mask, under the most favourable circumstances. We must wish him every success in his laudable efforts.

We must now go nearer home. About three years ago the Thames Angling Preservation Society instituted a "Sub-committee of Pisciculture," of which I have the honour to be a member, with a view to stock the river with valuable fish, by means of the artificial process of hatching. We first began by placing boxes in the meadow in the spring, but a flood, upon which we did not at all calculate, suddenly came on and endangered the eggs. Mr. Ponder and myself, therefore, determined to put up fish-hatching boxes in a situation where they would be out of danger. Mr. Ponder erected this apparatus entirely at his own cost in his own greenhouse, and he gives gratuitously his valuable time and experience to the management of the boxes, the Society paying the wages of the servants and the actual expenses incurred collecting the eggs.

During this present season Mr. Ponder has again added, at his own cost, a considerable number of boxes to his apparatus in the greenhouse, and he and I, with the able assistance of Andrew, the keeper, have been very busy the last two months collecting trout eggs from the preserves of gentlemen who have kindly given us permission so to do. The living result of our labours may now be seen in these boxes, which have become so crowded, that we have been obliged to lay some of them down in the meadow in the Christian spring. The following is a list of eggs now hatching out:—

English trout	97,000
French trout	4,800
Salmon trout	900
Great Lake trout	2,500
Ombre Chevalier	4,000
Rhine salmon	15,500
	124,700

and I hereby invite all who have heard my paper or read this report, to go and see Mr. Ponder's apparatus, at his house, Elm Grove, Hampton, about a mile from Hampton-court Station, and in the course of a few weeks will be seen over 100,000 young fish swimming about in the boxes.

During the collection of the English trout eggs I have been enabled to make many interesting remarks on the habits of spawning fish, which will be found recorded in the *Field*. I regret much I cannot mention them in this place.

The funds of the Society are not over abundant; if they were we could do much greater things. All anglers in the Thames ought, therefore, to support, by their subscriptions, our efforts to attempt to introduce salmon, ombre chevalier, and to multiply the number of trout and other fish in the Thames for the public good. Mr. Ponder and myself, moreover, in our official capacity as sub-committee of Pisciculture for the Thames Angling Preservation Society, have petitioned the Lord Mayor and the Court of Common Council of the City of London. They have been kind enough to favour our views, and to look upon our project with a favourable eye.

I will not now go into the question as to whether the salmon we turn out will return to the foul waters of the Thames. We are in hopes that when the main drainage works come into action the waters of our noble river will be clear enough for the salmon to run up—at all events, it is quite certain that if we do not turn fish into the Thames they will not be able either to run up or down; now it is most interesting to know that young smelts have been caught in smelt's nests at the mouth of the Thames, and these I have every reason to believe are of the young fish hatched in our apparatus at Hampton.

Some three years ago, Mr. Thomas Garnett, of Clitheroe, mentioned to me the possibility of making a hybrid between a salmon and a trout, and this year I have been able, luckily, through the assistance of Mr. Allies at Worcester, and the Worcester Fisheries Preservation Society, to impregnate salmon eggs with trout milt, and also to reverse the experiment, in one instance taking the small trout to Worcester alive, and there operating on the salmon eggs, and in the other bringing the ova of the salmon to London, and there operating on them with trout.

It is impossible to say what the result of this experiment will be, as the eggs have not had time to develope themselves. Should it, however, be successful, I have great hopes of obtaining a fish in which a non-migrating will be predominant over the migrating instinct. Should again these fish prove capable of bearing eggs, I would propose to cross them *again* with the common trout, so as to obtain a fish which shall be two parts trout and one part salmon. Anyhow, should my experiments this year prove worthless, I certainly intend to prosecute them again this year, as we know not where nature's law of hybridization commences and where it ends.

The observations drawn, and the results, be they good or bad, obtained from these experiments, both as regards the eggs from dead fish and the hybrids between the trout and salmon, will be recorded from time to time in the columns of the *Field* newspaper, to which I beg to refer, as it contains many articles relative to fish-hatching by myself and other observers of nature's operation.

This Acclimatisation Society, of which I am one of the honorary secretaries, being desirous to spread fish into waters where they are getting scarce, has taken up the matter, and the council have voted a sum of money for building an apparatus; the management of this they have entrusted exclusively to Mr. Francis Francis, of the Firs, Twickenham. A full account, with plans thereof, appeared in the *Field*, No. 583, February 27, 1864, from which I now quote the following particulars:—"The operation of laying the ova in the apparatus was commenced on the 24th of December last. Since that time 136,000 ova have been placed in the apparatus, and of these 40,000 have been distributed to members of the society (including a number of salmon and sea trout ova sent to the Huningue establishment), and from 5,000 to 6,000 have perished in the process. This amount of loss shows rather a small average. On Saturday 90,000 ova and alevins (young fry) were in the trays, viz., salmon, 6,5000; salmon trout, 5,000; common trout, 67,000; great lake trout, 7,500; charr (ombre chevalier), 4,000. The great bulk of these ova have been taken for the society out of English waters, under the direction of Mr. Francis, but for the ombre chevalier and great lake trout the society is indebted to the Huningue establishment, the director of which (M. Coumes) has most generously extended as much as was required to enable the society to meet all demands in this its first season of carrying on its operations. The ova and fry sent from the society's establishment are purchased only by members at the prices fixed by the piscicultural director. These prices are for the present entirely experimental; they are fixed at the lowest rates possible. The prices vary from 40s. per thousand for trout ova, to 50s. for salmon, with an addition of from 30 to 40 per cent for fry. Vitalised ova can be sent by railway, or any other mode of conveyance; but fry require attention during the journey, and those members who purchase them are expected to send persons to the society's establishment to receive them, and convey them to their destination."

Mr. Francis would doubtless be pleased to show his mode of operation to any one who would favour him with a call.

Besides the above-mentioned public establishments there are, I am pleased to report, several private ones now at full work in various parts of the kingdom. I cannot mention all of them, but, at the same time, cannot omit those belonging to Lord Churchill, of Cornbury-park, Oxford; to the Earl of Mountcharles; to Viscount Powerscourt; to Samuel Gurney, Esq., M.P.; to Alfred Smee, Esq.; to Higford Burr, Esq., of Aldermaston-park; to T. Hall, Esq., of Farningham, to J. King, Esq., of Watford, besides several ladies (for I am pleased to see that they also have taken up the subject)* and other gentlemen. Mr. Higford Burr and Mr. Hall, of Farningham, have devised most ingenious methods of combining the indoor with the outdoor apparatus, the one using the water from a spring in his park, the other the water from a mill-head, both places showing how water otherwise idle can be made to serve a good and useful purpose. I now submit to you a detailed and carefully drawn plan of Mr. Hall's apparatus, well worthy of being adopted by all who have premises suited to the purpose.

We, in this favoured land, who have, comparatively speaking, abundance of salmon and trout, should not be selfish, but should rather do our best to give our relations and friends, now in our colonies, the benefit of "home products." You have doubtless read and heard much of the experiments of taking salmon to Australia. My friend, Mr. J. Youl, who has taken the lead in this matter—and great credit is due to him for his energy and perseverance—has given me the very last news on this important subject as follows:—Upwards of 100,000 salmon and about 3,000 trout ova were sent out to Australia in the *Norfolk*. The ova were procured from the Tweed, the Severn, the Ribble, and the Dovey rivers, thus England, Scotland, and Wales contributed to this precious freight. 164 boxes, containing about 90,000 ova, were placed at the bottom of the ice-house, with a solid mass of ice nine feet thick on the top, so that every particle of this mass must melt before the ova would suffer. Sixteen boxes, containing above 13,000 ova, were placed in other parts of the icehouse, with ice below, above, and all round the boxes. The ova were taken between the 13th and 15th January last, placed on board the ship on the 18th, and the *Norfolk* left the docks on the morning of the 21st, and Plymouth on the 28th January. Thirty tons of Wenham Lake ice were used, and I am in good hopes twenty tons will remain when the ship arrives at Melbourne, which will be on or about April 8th; we shall have news back on or about the 12th of June.

Last year I had the honour and pleasure of assisting Mr. Youl in his experiments, and we found that we could keep salmon eggs in ice (through the kind assistance of the Wenham Lake Ice Company) from periods varying from 57 to 144 days, and that the young fish would hatch out of the egg. The details of these experiments are recorded in my little book on fish-hatching.

The *Norfolk* has run from Plymouth to Australia in 71 days, and she has made this short passage no less than three times; we have therefore great hopes that the present experiment will succeed. I am sure all my audience as well as all my readers will wish this also, and that they will, both as regards this and also our former endeavours for the public good, with one accord unite in the joyful cry of "Vive la Pisciculture."

I cannot conclude this paper without reminding you of another lesson which we ought to learn, and which we should by no means neglect. The science of fish-hatching is (as I trust you will admit now that you have heard my story) both interesting as a study, and also likely to be productive of much public good. In it, moreover, we can have under close observation one of nature's most mysterious and wonderful works, which, if taken in hand by such a master-mind as that of my late lamented father (the Dean of Westminster), would, indeed, form a new and most valuable addition to the "Bridgewater Treatises," in which the "Power, wisdom, and goodness of God, as manifested in the Creation," are so ably set forth.

DISCUSSION.

The CHAIRMAN invited the meeting to discuss this paper. He might say that for fourteen or fifteen years he had been practising this fish-hatching, and could entirely confirm every word Mr. Buckland had said.

Mr. FENNELL (Inspector of Fisheries) said every one present must be convinced that the country was under great obligations to Mr. Buckland for the way in which he had carried on experiments which were likely to become of the greatest use; such a man the world had long wanted. He (Mr. Fennell) had for many years past been anxious that this subject should be taken up by scientific men. He had himself been placed in a position in which he had been called upon officially to co-operate with other persons in proposing to the consideration of the legislature such regulations with regard to the fisheries of this kingdom as were in conformity with the laws of nature and the habits of the fish themselves. He had never professed to enter into the scientific part of the subject; he had had opportunities for close observation, but that was not enough. In the investigation of this question hitherto, there could be no doubt that antagonistic interests had operated to a very great extent against proper legislation on the subject of our fisheries. In an official investigation in Ireland in which he was concerned, an important question in natural history arose. The parties interested were represented by counsel, by whom the most opposite scientific theories as to the habits and properties of fish were advanced, so as to suit as far as possible the interests of their respective clients, until at length an adjournment of the investigation was agreed upon, in order that the questions raised in the course of the inquiry might be referred to certain members of the Natural History Society there. It was, however, found that they were not able to give any information with regard to the sole, the salmon, or the turbot, which would assist the Commission in coming to a decision. It was, therefore, quite apparent that scientific investigation of this subject was wanted, and they must feel greatly indebted to Mr. Buckland for the zeal with which he had come forward in this matter. It was very far from his (Mr. Fennell's) wish or intention, in the few remarks he would offer, to throw cold water upon anything connected with the piscicultural movement that had lately taken place in this country, but he would refer to a few plain facts for the future guidance of those who were interested in the subject. Mr. Buckland had spoken of fish as being great cannibals, and had referred to the immense amount of destruction that took place in the ova, particularly of the fresh water species. Even those fish which did not depart from their native streams were liable to considerable destruction, but with regard to the migratory species, when they reached the sea they had to encounter enemies of the most formidable kind, and suffered still more seriously. To mention a practical fact on this subject, he would take the case of the Tay fishery, which was the most extensive and valuable fishery in Scotland. The annual catch of salmon from that fishery was of the value of £30,000, and taking the moderate calculation of four salmon as representing a value of £1 sterling, that gave a total number of only 120,000 fish—adult salmon—out of the vast number that were annually propagated in the Tay, and that yield of fish was only equal to the produce of twelve salmon of 10 lbs. weight each! They need not go further than that for proof of the immense destruction which took place, both in the spawn and young fry of this valuable fish. Allusion had been made to the fisheries of Mr. Ashworth. At the time that gentleman entered upon the occupation of his fishery, he found it in a very exhausted state, but since his occupancy he had brought up the annual catch of salmon from 500 or 600 to 14,000, and yet he began with the produce of only one pair of salmon. He (Mr. Fennell) had brought forward these facts with the view to show that if any great commercial results were to be obtained from the artificial propagation of these fish, they must be tried not only by thousands, but by millions, inasmuch as their enemies, both in fresh-water and in the sea, in the early stages of existence, were greater than could be conceived, which accounted for the very small per-centage of actual production. Upon a moderate calculation, he believed not one fish out of a hundred bred was available for use. He hoped these few observations would by no means discourage those who engaged in pisciculture, or deter others from entering into it, but the object of his remarks was to point out the extremely large scale on which the propagation must be carried out—far beyond anything hitherto attempted—to enable it to be brought to commercial importance.

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* See the *Queen*, January 30, February 27, March 5.

Mr. Higford Burr said he had made a great many experiments on a limited scale in this direction, and was gratified to find that as far as he had gone his proceedings had met with Mr. Buckland's commendation. As far as his own experience went he could state that the system explained by Mr. Buckland answered extremely well, and with a proper amount of attention could hardly fail to be successful. He had received salmon's eggs from France, which had been transmitted in 40 hours, and also from Clitheroe, which were 72 hours in transmission. As far as his experience went the latter breed of fish were of delicate constitution, and not so hardy as the naturalised salmon trout: but he hoped to be able to rear a sufficient number to ascertain this definitely. He had tried the experiment of crossing trout with perch, and had succeeded in obtaining and hatching spawn of the grayling crossed with the pike.

Mr. Hall mentioned that at the temperature of 37° to 43° he had been very successful in hatching, and had lost but few of the young fry.

Admiral Sir Edward Belcher said the Chinese had been in the habit for a long period of rearing fish precisely in the manner described by Mr. Buckland, but they also reared frogs in the same way, and these were regarded as a very choice article of food. The catching of the fattened frogs was effected by baiting with a small frog, in the same way as a small fish was used as a bait for pike, &c. He could confirm to the fullest extent the statement of Mr. Buckland as to the great abundance of salmon in the Arctic regions. He had himself assisted in catching immense quantities of those fish there. The natives cured them, and the American whalers took large numbers away for their consumption. He found there were at least a dozen varieties of salmon in those latitudes, some being more of the trout species, others with green transparent noses, which he believed were not found elsewhere. Going further northward to the arctic circle, these fish were found in immense numbers at the mouths of all the estuaries which sent down muddy fresh water; so thick were they that in the shallow waters they could almost be caught with the hands, and this was actually done when Parry and Ross were there. Mr. Buckland had spoken of our having introduced the blue-bottle fly into some of the colonies. It might have been supposed that flies belonged to any country, but this was not the case, for when the mutineers of the *Bounty* ran away to Pitcairn's Island, they remained for some years without ever seeing a fly, and their food was safe from the attacks of those insects, but when they were visited by two frigates from England, flies were then introduced. There was a species of reptile not yet mentioned, which was very destructive to fish, namely, the fishing-snake. This reptile formed his circle round and round the fish, and then taking hold of the fore fin with his mouth, landed the fish on shore, and made it his prey. With regard to the salmon spawn being preserved in cold latitudes, he might state that as the rivers became frozen in November and remained so till May, there was a period of 181 days during which the spawn remained in the ice in those regions where salmon most abounded, so that he thought his friend Mr. Buckland need be under no apprehension as to the safety of the eggs that he had mentioned as being now on their way to Australia, packed in ice. There could be no doubt that that spawn would reach its destination in perfect safety. As a method of preserving the young fry after hatching he would suggest that a space should be allowed them in the stream where the water ran shallow, and that brushwood or something of that kind be laid down, so that the young fish might remain unmolested by their numerous enemies till they were able to work themselves out with the tide, and could take care of themselves. Means might also be taken to prevent the fish from going out into deep water in the sea. In the case of feeding and rearing trout, he thought if the water were carried from one reservoir to another, and made to tumble in its progress so as to impregnate it largely with air, it would be attended with very beneficial results to the fish.

The Chairman mentioned, as a fact of interest, that he had in his possession a letter of Sir Humphrey Davy's respecting the property of which he (the chairman) was now the owner. Sir Humphrey was anxious to hire the river for the sake of carrying out the experiments, the successful prosecution of which they had heard of this evening.

Mr. Buckland remarked, with regard to what had fallen from Mr. Fennell as to the necessity for carrying on these hatching and rearing operations on a more extended scale, it could be done by millions as easily as by thousands; it was only a question of having more hatching boxes or troughs. Following the remarks of his gallant friend (Sir E. Belcher) with respect to securing the fish on their migrating to the sea, he would say there were several large inland lakes which could perhaps be made available for the purpose, for instance, an arm of the sea behind the Chisel bank at Weymouth. The fish would then not be out of reach, and at the same time they would be protected in a great measure from their destructive enemies. With respect to what had been stated by Mr. Burr, he would add that he had received a letter from Dr. Genzick, of Lintz, Upper Austria, stating that he had succeeded in procuring a hybrid between the charr and the trout, and it was difficult to say where nature's laws in that respect began and where they ended. With respect to the rearing and breeding of frogs as an article of food by the Chinese, it appeared that several years ago the Italian Professor Spallanzani bred frogs artificially by way of experiment, but he never hit off the idea of applying the process to fish, otherwise he would have anticipated the discovery of the French fishermen. He was extremely delighted to hear the statement of Sir E. Belcher, with respect to the length of time the spawn remained in ice under natural conditions in the northern regions, which strongly sustained his hopes with regard to the Australian enterprise, upon which the hopes of Mr. Youl, himself, and many others were so ardently fixed. He was also pleased to hear Sir Edward's confirmation of there being such a quantity of salmon at Petropaulouski. With regard to the fishing-snake, the hydrophis, he recommended a wide berth should be given to them, as he believed they were very venomous. Admiral Sir H. Keppel told him of a midshipman having died almost immediately after a bite in the finger from one of those reptiles, which he had caught when fishing for him with a hook baited with a fish.

Sir Edward Belcher was understood to say that the sea fishing-snake was venomous, but the fresh water species was not so.

The Chairman then proposed a vote of thanks to Mr. Buckland for his highly interesting and valuable paper, which was carried by acclamation.

The paper was illustrated by an exhibition of live salmon and trout, and also double-headed fish, and other monstrosities, by means of the oxy-hydrogen microscope, under the management of Mr. G. H. King; also by a cast of fish by Mr. Ward, and drawings and diagrams by Mr. W. H. Briscoe and Mr. Searson. The whole process of fish-hatching was shown in the room by means of the arrangement of earthenware troughs described in the paper.

Proceedings of Institutions.

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Bacup Mechanics' Institution.—On the 2nd March, Mr. Benjamin Brierley, author of "Sketches of Lancashire Character," &c., read selections from his writings at the Mechanics' Institution. Mr. Kelly performed select pieces of music on the accordion. Mr. Frank Hunter presided.

Canterbury Church of England Young Men's Literary Association.—The committee, regarding the reading-room and library as most important parts of the association, have endeavoured to increase their usefulness by keeping a good supply of newspapers and periodicals in the reading-room, and by making additions, from time to time, of instructive and interesting books to the library. The number of volumes at present in the library is 1218, making an increase of 36 during the past year; the number issued was 1936. A desire having been expressed that a French class should be established, the committee appointed Mr. Martinet as instructor, and are making arrangements for the re-opening of the class. The committee desire to express their high sense of the efficient manner in which their late secretary, the Rev. E. Gilder, fulfilled the duties of his office, and offer to him their very best thanks for his valuable services. The treasurer reports that the receipts have been £142 3s. 1d., and that the balance in hand is £47 8s. 7d.

Farnham Young Men's Association.—On the 26th February, a lecture was delivered by the Rev. Canon Carus, the Bishop of Winchester, president of the association, occupying the chair. The subject was "Science; its failures and successes." A vote of thanks to the lecturer was proposed by the Archdeacon of Surrey, and carried unanimously.

Glasgow Institution.—In the fifth annual report the directors regret that they cannot speak of an increase of students, as on every former year since its commencement. When they consider, however, the severe privations to which the working classes in several branches of industry have been subjected, they have no reason to feel unduly depressed, more especially as the attendance has really been such as still to maintain the Institution self-supporting in its own proper expenses. The numbers on the rolls of the evening and other students' classes on May 10, 1862, was 238; admitted during the year ending May 10, 1863, 508; total, 746. In the juvenile day classes there were on the rolls, May 10, 1862, 143; and admitted during the year, 99; total, 242. The total number of individuals who received instruction in 1862-63 has therefore been 988. The number of tickets sold was 1,546, exclusive of those on the rolls at the commencement of the year. The number of individuals who have received instruction in the Institution since it was founded, in 1858, has been 3,186. The numbers on the rolls for the summer season are, evening and other students' classes, 116; juvenile day classes, 129; total, 245. The average number annually for five years has been, evening classes, 686·4; day classes, 218·6; average of total numbers, 905 annually. The average length of time which scholars attend in the day classes is 2 years; of students in the evening classes, 6⅓ months; but as students attend irregularly, or remove before their terms expire, the real length of time they attend to receive instruction is much reduced—perhaps to an average of 5 months. Of students of branches not recognised by the Society of Arts, or too young (below 16), who came forward for Local Board certificates, 12 came forward to the preliminary examination, of whom 2 were rejected; and to the final, 10, of whom 3 were rejected. The Local Board, as inspectors of all the classes in the Institution, appointed a committee to examine such of the juvenile day classes as might be thought competent for certificates from the Local Board. 44 appeared, and to them were awarded—14 first-class certificates; 13 second; and 15 third. The financial statement shows that the receipts were £342 15s. 1d., and that there is a balance against the Institution of £48 5s. 10d. In conclusion, the directors strongly draw the attention of students to the great advantages of the examinations of the Society of Arts. They say:—"A certificate from it marks a man for life in the branch or branches certified as effectually as M.A. or M.D. marks him in the learned professions. Indeed, it would be a very great advantage to the passed candidate, if the Society would grant certain initials to those who obtain first-class certificates for a certain number of branches—say five or six."

Slough Mechanics' Institute.—The annual soirée was recently held, when upwards of 200 persons were present. The chair was taken by Captain R. B. Harvey, M.P. The proceedings were enlivened by music. Mr. Brown, hon. sec., read the annual report. The committee, after congratulating the members on the satisfactory position of the Institution, stated that the accounts showed a total of receipts amounting to £122 2s. 5d., of which £5 14s. 4d. was referable to the soirée held last year, and £23 4s. 8½d. to the rural fête in Stoke-park. The whole expenditure for the same period reached the sum of £88 9s. 9d., leaving a balance of £33 12s. 8d. in favour of the Institution. The society consisted at the present time of 13 gentlemen who paid a guinea a year, 44 tradesmen who paid 12s. a year, 50 tradesmen's assistants paying 8s., and 26 youths under the age of 18 years paying 4s., making a total of 133 members. A marked aid had been given by the continued kindness of the president, Lord Taunton, in extending the privilege of holding the annual fête in Stoke-park. 1,196 volumes had been issued from the library during the past year. From 40 to 50 members daily used the reading room. The drawing class had been very successful. In May last, the most advanced members of the class were examined by the Society on Arts. The examination resulted in eight certificates—four for geometrical and four for free-hand drawing. The examination by the Committee of Council on Education was held also in May, when seven of the junior members of this Institution passed very creditably. In November an examination was held at South Kensington, in which one student gained a first-class certificate for geometrical drawing, and two others had their certificates raised, and also gained a certificate each in building construction. The class numbered 36, with an average attendance of 28. The arithmetic class consisted of 23 pupils. There was an average attendance of 15. The lectures during the year were well attended.—The Chairman then delivered the certificates awarded by the Society of Arts, the prizes purchased with the subscriptions of friends connected with the Institution, and the certificates awarded by the Science and Art Department. A vote of thanks was passed to Mr. Chapman, to whose exertions the success of the drawing class was mainly owing. Other votes of thanks was also passed.

Southampton Athenæum. — The fifteenth annual soirée of this society was held on the 8th ultimo, when the members of the Institution gave their earnest co-operation to the committee to produce an excellent entertainment, at which about 400 persons were present. The meeting (which was held in the Victoria Assembly-rooms) was opened by a short address by the Chairman, congratulating the members on the improved financial and useful position of the society. The band of the 2nd Hants Volunteer Rifles performed during the evening. There was an excellent collection of photographs and stereoscopes on view, and a number of antiquities, specimens of pottery, ore, china vases, coins, and ivory carvings. There were also a large number of microscopes. The comic scene, "The Haunted House," was enacted. The dramatic class gave the comedy of "Diamond cut Diamond," and the farce of "A Fish out of Water," the whole of the characters being sustained by the male members. The lady members assisted by arranging a post-office, and various other amusements were given during the evening, which appears to have been most successful.

Fine Arts.

Art Exhibitions in France.—These are multiplying on every side, in the provinces as well as in the capital. Exhibitions are now open at Bordeaux and Lyons; the *Société Lorraine des Amis des Arts* announces another at Nancy, to open on the 10th of May; Angers holds its first public exhibition in the same month, and the artistic taste of the people of that locality gives promise of considerable success; and even Melun is about to add a collection of pictures to its usual agricultural exhibition. A commission has been appointed, with the Superintendent of the imperial department of Fine Arts as its president, and the grandsons and nephew of the late Horace Vernet as members, to collect as many works as possible, not only of Horace, but of his father and grandfather, Carle and Joseph Vernet, with the view to their exhibition in the Palais de l'Industrie, in the Champs Elysées. It is expected that the number of paintings and sketches will amount to more than a thousand. Lastly, the *Société Nationale des Beaux Arts* has just opened its first exhibition, with about three hundred pictures, statues, bronzes, &c. The exhibitors' list includes some of the best artists of the day, and Gustave Doré has contributed more than a hundred works. This society is entirely independent, and presents certain remarkable features. It includes, at present, as members, about two hundred artists, besides a large body of amateur members. Each artist candidate must present a work for examination by the committee, which, at present, includes the names of Théophile Gautier, Millet, Baudry, Hébert, and other well-known artists and critics, and his election depends on their judgment; and each member undertakes to send at least one work to each annual exhibition, and is at perfect liberty to contribute as many more as he may think fit. The public forms the sole jury. The society is, moreover, an artistic club: it has its morning concerts, which have already become famous, and in the evening the rooms are thrown open for reading, conversation, music, and amusement, the only rule being that there shall be "no political discussions or personal altercations." This new society has been taken up very warmly by many persons, and some people go so far as to predict that in a few years there will be no public exhibitions upon any other plan than that above described.

Sale of Chinese and Japanese Curiosities in Paris.—The sale of the collection Louirette has drawn all the amateurs to the Auction Mart for several days, and extraordinary prices have been obtained. Two fine perfume burners, in incised enamel, fetched 14,000 francs (£480), and a small vase of the same character brought 3,825 francs. The rage for Chinese and Japanese art, in Paris, is also exhibited by the opening of a number of shops, one at least containing a magnificent collection of all kinds of wares; and in the adoption of the Chinese style of ornament by the manufacturers of various objects of art and luxury.

The Delacroix Sale in Paris.—The interest excited by the sale of the works of the late Eugene Delacroix has been maintained to the end—the last of the sketches having fetched enormous prices. A small pen-and-ink drawing of a man attacked by a lioness, in the artist's best manner, realised 1,000 francs; and a water-colour drawing of a horse overthrown by a tiger, 1,220 francs. The total proceeds of the ten days' sale amount to 368,079 francs—more than £14,723.

Mulready Exhibition.—The example set by the Society of Arts in 1848 has been followed, with greater opportunities, on a larger scale, and in a more complete manner, at the South Kensington Museum. A collection, believed to be complete, with the exception of three pictures, of which the only important item is "The Widow" (exhibited at the Royal Academy in 1824), of the works of William Mulready, opens to-morrow (Saturday), in two of the rooms on the upper floors of the museum named. In one of the rooms are about one hundred and ten pictures in oil, the outcome, so far as the public exhibitions were concerned, of the life of the painter. The other room contains nearly one thousand drawings, comprising studies in water-colours, pen and ink, red, white, and black chalks, and pencil. A considerable proportion of the works executed in chalk are studies from the nude life—drawings which, without the chance of question or denial, are affirmed not to have been surpassed for beauty, completeness, or knowledge they display, by the productions of any masters, living or dead. One thing strikes the visitor, *i.e.*, the perfect chastity and purity of this mass of works; the figures are as pure as the spectator's mind. Some of the studies of foliage, etc., show the indomitable artist's method of working, and his extraordinary care. Among the oil pictures are some of his first-exhibited works, "The Crypt of Kirkstall Abbey" (1804), and "St. Peter's Well, York Minster" (1806). One of the interesting characteristics of this exhibition is the fact that several of the examples have not been seen publicly for fifty years. See "The Rattle" (R.A., 1808), "The Carpenter's Shop and Kitchen" (British Institution, 1809), "Boys Fishing" (R.A., 1814), a beautiful work; see also "Punch." We will now name the most important examples, in their chronological order—"The Mall, Kensington Gravel Pits" (1812), "The Fight Interrupted," "The Village Buffoon" (diploma picture at the Royal Academy), "The Wolf and the Lamb," "The Convalescent from Waterloo," "The Travelling Druggist," "The Cannon," "The Dog of Two Minds," "The First Voyage," "The Last In," "A Brother and Sister," "All the World's a Stage," "Bob Cherry," "First Love," "The Sonnet," "Train up a Child," "The Ford," "The Whistonian Controversy," "Choosing the Wedding Gown," "Haymaking," "The Butt," "Women Bathing," "The Bathers," and "Blackheath Park" (1852). The exhibition is open to the public in the same manner as the South Kensington Museum, *i.e.*, free, from 10 a.m. till 10 p.m., on Mondays, Tuesdays, and Saturdays; for sixpence, on Wednesdays, Thursdays, and Fridays, from 10 a.m. till 5 p.m.

Royal Academy.—On Wednesday last the Royal

Academicians met and finally passed their report in favour of Lord Elcho's commission last year. It will be forthwith submitted to the Queen, and then published. It is said that the members were unanimous in rejecting the proposition of introducing lay members to advise and control the Academy in exercising its professional functions. It is the business of the painter to paint, and the layman to pay for the work if he pleases.

Manufactures.

Coal and Iron in France and other Countries.—A work on property in minerals, by M. Edouard Dalloz, was presented a few days since to the Academy of Moral and Political Sciences of Paris, by M. Wolowski, who read a report on the book in question and on various matters connected with the subject on which it treated. M. Dalloz treats especially of mineral legislation in France and Belgium, but touches incidentally on that of other nations, and also upon the statistics and economy of the mineral question in general, its bearings and influences. In connection with the statistical portion of the question, M. Wolowski was able to avail himself of more recent records than those used by M. Dalloz, and made an elaborate report to the Academy, from which the following is extracted:—In 1789 France used only half a million tons of coal a year, and of this little more than one-half was raised at home; but in 1830 the production had grown to 1,800,000, and the quantity imported to 600,000 tons. The progress made since that time is as follows:—

	Production. Tons.	Importation. Tons.	Consumption. Tons.
1835	2,500,000	800,000	3,300,000
1840	3,000,000	1,290,000	4,290,000
1845	4,000,000	2,200,000	6,200,000
1847	5,400,000	2,500,000	7,600,000

During the four following years political events stopped the growth, both of production and consumption; the quantity raised in France fell back to four millions of tons, and the imports to little more than two millions. Since 1852 the progress was great and constant—

1853	5,900,000	3,500,000	9,400,000
1854	6,000,000	4,000,000	10,000,000
1855	7,400,000	5,000,000	12,400,000
1856	7,900,000	5,000,000	12,900,000
1857	7,900,000	5,195,000	13,095,000
1858	7,353,000	4,840,000	12,200,000
1859	7,483,000	4,900,000	12,400,000

In 1860 came the change in the tariff, and the following are the results to the present time:—

1860......	8,391,000	5,200,000	13,600,000
1861......	8,400,000	5,300,000	13,700,000
1862......	9,400,000	5,200,000	14,600,000
1863......	10,000,000	5,200,000	more than 15,000,000

The return for last year being an approximate estimate made by the Imperial Administration of Mines. By these figures it will be seen that France raises for herself at present as much as she consumed in the whole of 1854; and that the consumption itself has doubled since 1847. It will be observed also, a fact not noted in the report, that since 1860 there has scarcely been any increase in the imports, while the home production has grown about 20 per cent. Side by side with these facts M. Wolowski drew special attention to the fact that the quantity of coal brought to the surface in England had grown from twenty-six millions of tons in 1837, to eighty-four millions in 1862, and that she produced far more than the half of all the coal raised in the world. The produce of America was given at fifteen, that of Belgium at nine, and of Germany at upwards of fourteen millions of tons per annum. As regards iron, the whole of the furnaces in France only produced 69,000 tons of pig iron in 1789, 115,000 tons in 1812, and 112,500 tons in 1819. Since that time there has been a great increase, and it is important, says M. Wolowski, to see what has been the effect of the commercial treaty of 1860. In 1830 the quantity of pig iron had risen to 347,773 tons and that of wrought iron to 237,379 tons, and in 1847 it had grown to 602,772 tons of the former and 376,686 of the latter. In 1848 the totals had fallen off to the extent of 50 per cent. No reaction occurred till 1854, but in 1859 the totals were 856,000 and 520,000 respectively, rather less than those of 1858, and considerably below those of the previous year. During the years 1860-1 a great increase took place, and in 1862 the amount of pig iron produced rose to 1,053,000 tons, while that of 1863 is estimated at 1,180,000 tons. Of the last total, says M. Wolowski, 280,000 tons were charcoal iron, the remaining 900,000 tons having been produced with the aid of coal alone or mixed. As regards wrought iron the report gives the following return for the year 1863:—

	Tons.
Charcoal iron..	76,800
Coal iron	606,000
Mixed fuel...	22,700
Total	705,000

The production of charcoal iron has fallen in the last three years from 90,655 to 76,800 tons, while that of coal iron has risen from four to six hundred thousand tons. In 1847, more than half the iron produced in France was charcoal iron. The total product of all Europe in 1808, according to M. Héron de Villefosse, was only 825,000 tons of pig iron, while the quantity now made is about seven millions of tons, of which England produces nearly four; and in 1862 France, 1,180,000; Germany, 591,593; Sweden, 143,000; Austria, 270,000; and Belguim, 161,000 tons. After such totals as these it is curious to note that in 1740 England made none but charcoal iron, and only produced 17,500 tons in the year.

Metric System of Weights and Measures.—Mr. Ewart's Permissive Bill for the introduction of the metric system into this country passed the second reading in the House of Commons on Wednesday, by a majority of 90 to 52. Mr. John Bennett, in a letter to the *Morning Star*, says:—"How strange it is that, though the value of the decimal system is well understood on the Continent, its adoption should still remain uncared for by our Parliament! As a watch and clock maker I have to lament the failure of our productive powers in competition with the French, the Swiss, and even the Germans. They beat us by their better system of education, which throughout Switzerland is universal, gratuitous, and compulsory. Another great element of their success lies in their enlisting the delicate and patient fingers of their female population. But with these advantages their superiority would not be so complete if they had not everywhere the practical benefit of an uniform metric system of weights and measures as the only legal standard for guidance in their manufactures. The manufacturer of watches in a Swiss village can thus act through orders he may send for a few pence by telegraph to workmen and workwomen, at their own homes, a hundred miles away from him, for by the decimalised metric standard every workman can set his tool with such mathematical precision that the part upon which he is engaged cannot fail to fit in the machine which is laid down in corresponding sizes. Thus our rivals have a great advantage over us, in a more minute subdivision of work, in the ability infallibly to hit off dimensions with such exactness that they want no cobbling into shape in order to fit them for their work; and, lastly, the manufacturer is in a position to select the best hands, whether they live far or near from the spot where his central operations are carried on."

The British Horological Institute offers a prize of thirty guineas for the best "Treatise on the Detached Lever Escapement and its Varieties." To fulfil the object of the prize-donors, it is desirable that the treatise should embrace the history of the various improvements in the "Lever Escapement" to the present time, pointing out the advantages said to be obtained by each, together with practical directions for securing the action sought by the inventor. It should also treat of the subject generally, giving tables of proportions of the various parts for the ordinary constructions, and explaining the effects of vibration in these proportions. It is also extremely desirable that the procedure followed by an expert escapement maker, in making a first-class escapement, should be clearly described. To make the essay still more practically useful, it should notify to the examiner the points to be especially tested and the best means of rectifying any discovered error. Various tools for effecting the several measurements, and for facilitating the completion of the escapement, should also be described. The text would be more readily understood if illustrated by simple diagrams. The competing essays must be delivered in, on or before the 3rd September, 1864. The Prize-Fund has been raised by subscription, and there will be three judges—two of whom have been nominated by a majority of the subscribers, viz., W. Hislop, Esq., F.R.A.S., and A. Walsh, Esq., M.Inst.C.E., and the third is to be nominated by the authors of the essays.

Commerce.

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PRESERVATION OF MEAT.—The preservation of meat, whether for the use of our sailors on board ship, or for other purposes, has long engaged the attention of scientific and practical men, and various ways of effecting this object have been from time to time devised. The methods hitherto adopted on a large scale have been the packing of cooked meat in air-tight cases, or impregnating it with salt and keeping it in barrels immersed in brine. The first, though effectual for preserving the meat for almost any amount of time, leaves the flesh, even when the utmost care is taken in the process, more or less insipid and tasteless; the second, though also preservative for a considerable time, renders the meat not only flavourless, but absolutely extracts from it, as Liebig tells us, nearly all its nutritive properties, as well as those peculiar qualities which are necessary for keeping the body in health. It is well known that a long continuance of such food, thus prepared, engenders scurvy. The Admiralty are now making experiments with a process devised by Dr. Morgan, an Irish gentleman; and a few weeks since some animals were slaughtered, and their carcasses subjected to this process in the presence of officers of her Majesty's Victualling Department at Deptford. A bullock having been killed in the usual way, the chest was immediately opened, and a metal pipe with a stop-cock inserted in connection with the arterial system. This pipe was connected, by means of elastic tubing, with a tub filled with brine placed at an elevation of about twenty feet above the floor. The stop-cock being turned, the brine forced itself through the arteries of the animal, and, passing through the capillaries, flowed back through the veins, carrying with it all the blood, making its exit by means of an incision provided for that purpose. About six gallons of brine passed thus through the body, washing out all the blood from the vessels. Having thus cleared all the vessels, the metal pipe was connected with another tube similarly placed, containing the preservative materials to be injected, and at the same time their exit, after traversing the body, was prevented. On communication being made, the liquid became forced into the vessels, and, by means of the pressure, it penetrated into every part of the animal, and might be seen exuding at any point where an incision was made. The liquid used on the occasion of the late experiments consisted of six gallons and a half of brine, 10 lbs. of sugar, ¾ lb. of saltpetre, with half a bottle of catchup and an infusion of cloves and pepper. The whole process is very rapid, and is extremely simple, requiring nothing that can be termed machinery. It took no longer than three minutes to send the first six gallons of liquid through the animal to wash out the vessels, and about three minutes more to inject the animal with the preservative liquid. Indeed, so rapid is the whole proceeding, that, even on the occasion above referred to, where the men were unaccustomed to the work, and the arrangements were necessarily imperfect, the time occupied was only twenty minutes from the killing the animal to the complete infiltration being made. The beast is then skinned, cut up into pieces, large or small, as may be required, and taking to a drying room, where it is hung until thoroughly dried, after which it is packed in boxes with sawdust and charcoal. It is confidently believed that the meat treated in this manner will stand any climate, and the flesh is free from the insipidity of that ordinarily preserved in tins, and its goodness is not destroyed by having nearly all its valuable properties drawn out by immersion in brine. So far as its preservative powers have been tested in this country, the process is stated to answer the purpose. A purveyor at Portsmouth has for some time past treated meat in this way with success, and sells it in the regular course of trade. It is obvious that any variety of liquids, chemicals, or condiments may be thus injected into the animal, and the meat flavoured in any way that may be thought desirable; the meat may also be dried or cured like ham or bacon, if so wished. Indeed, it would seem that the method is peculiarly fitted for this purpose. In hot countries, and in countries where animals are abundant, and where now they are bred almost entirely for their wool, fat, and hides, the process seems especially valuable, as by it the meat, instead of being thrown away, might be rendered available for export for food to other countries. The Victualling Department have had a few animals thus prepared for experiment, and it is intended to send the meat out on voyages to various parts of the world to test its keeping qualities. So little machinery is required, that a ship's crew could readily carry out the process at any place where they could land and animals were abundant, and thus lay in a store of meat which, although, no doubt, salted to a certain extent, would not have the same disadvantages in a sanitary point of view as meat preserved in brine-pickle. Some lengths of india-rubber tubing, pieces of metal tube with stopcocks, and tubs for holding the liquid, are all that is required. In hot climates the drying may be effected in the open air, and in other cases there would be no difficulty in arranging a room for the purpose, either on shore or on board ship.

COTTON IN PARAGUAY.—The cultivation of cotton in Paraguay last year has actually exceeded in extent that of tobacco, one of the principal staple products of the Republic; and there is every reason to believe that the plant will be still more generally grown in the present and future years. Intelligence had arrived that the samples of Paraguayan cotton sent to Manchester had been valued at a good price, and been pronounced to be of fair quality; and there can be no doubt that a knowledge of this fact will have a stimulating influence upon the agricultural classes of that country. The movement is being warmly promoted by the Government, and praiseworthy efforts are being made for the distribution of seed and the dissemination of information.

Colonies.

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FLOOD AT MELBOURNE.—A flood occurred about the middle of December last, which is admitted to be the most formidable visitation of the kind which has been experienced since the foundation of the colony. Melbourne was entirely surrounded by water. The Yarra rose in some places fully 50 feet; in other parts, where the banks are low, the river disregarded its natural sinuosities, and rushed along, a turbid torrent. At Prince's Bridge the

Yarra is ordinarily about two chains wide. During the height of the flood the water extended from the Suburban Railway on the one side to the Immigrant's Home on the other, a distance of about a third of a mile. The southern approach to the bridge was completely hid in water, which dashed over the roadway like a cataract. All the low land, bounded by the city, Emerald Hill, and Sandhill, was hid in one large sea, and the water was up to the eaves of every house and store in that locality. Emerald Hill looked like an island, and the road to Sandridge could be traced only by the tree and fence tops. Traffic had to be suspended for several days on the Hobson's Bay Railway, and people who had business between the city, and Emerald Hill, and Sandridge, had to be conveyed to and fro by boats. Stores and warehouses were under water, and publicans had to establish lines of boats to avoid loss of custom. Steamers and sailing vessels, though ready to leave harbour, had to remain at the wharves, because the flood would not allow the Yarra to be traced, and the works of the Melbourne Gas Company were inundated, and, in consequence, the city was in partial darkness for several nights.

TASMANIAN FURNITURE.—The *City of Launceston*, which was to leave for Melbourne on the 15th December last, took, amongst other cargo, the first shipment of Tasmanian-made furniture which left the port of Launceston. It consisted of about seventy packages of chairs, tables, &c., all made of Tasmanian woods, chiefly light-wood, and produced at a steam manufactory. A hope is expressed that this venture will meet with success, and be the means of opening up a new branch of trade with the neighbouring colonies.

THE "LIGHTNING ROCK" (VICTORIA), so named from the circumstance of its discovery, will not probably be much longer dangerous to inward or outward-bound vessels passing through the "Rip." The *Victoria* has lately been employed in the work of its removal, so far, at least, as to put it beyond the bounds of possibility that ships of even the very heaviest tonnage should strike upon it under any circumstances. So great a mass of the rock has already been removed by blasting as to render it harmless, but it is intended that the operation shall be continued until a great deal more of it has been detached from the main body, which has many fathoms of water upon it, even in the lowest tides.

CROWN LANDS AT MELBOURNE.—A series of sales of Crown lands were held in Melbourne during the month of December, consisting of town, suburban, and country lands in various districts of the colony, which have at most times found ready purchasers at prices mostly in advance of—and in many instances at rates considerably above—up-set prices. Amongst other lots offered were sections of land at Echuca, the crossing place of the river Murray, on the confines of the colony of Victoria and the ultimate terminus of the Government railway. The prices obtained will give some idea of the importance of the locality with a view to future business sites. The total amount realised was £13,788 6s. 1d., of which £8,913 was the proceeds of 47 acres 1 rood 19 poles of town allotments; £1,746 13s. 5d. the return for 634 acres 1 rood 14 poles of suburban lots; and £3,128 12s. 8d. the produce of 2,682 acres of country lands.

A NEW MINERAL, says a Melbourne paper, has been discovered in the neighbourhood of the Upper Yarra. The mineral resembles that well known as sapphirine, and is harder than topaz, which it scratches. It will be principally valuable for the lapidary, polishing other stones, &c. Although it has as yet only been found in the portion of the colony above referred to, it is likely to be met with wherever the granite formation predominates.

NATAL.—This colony is making rapid strides. The year's crop of sugar is estimated at 3,000 tons, and the prices are now such as to put the growers into high spirits. The increase in the number of banks has materially reduced the price of money.

Correspondence.

VERIFICATION OF OLIVE OIL.—SIR,—In the very able paper read by Mr. Tomlinson, on the 2nd instant, great stress was laid on the importance of chemically clean water being employed, the success of these experiments on cohesion figures depending mainly on the absence of any organic deposit which would spoil the surface contact. And I should be led to infer that chemically clean water, by a parity of reasoning, was equally important, but he previously stated that the ordinary water, such as supplied by the New River Company, was sufficiently pure for the purpose. I recollect, some few years since, submitting samples of water from various sources to microscopic test, that of the New River amongst them, and the result showed minute organic matter in large quantities, especially in those portions taken from the stream near town. I should think it probable that in such a case, on the contact of the drop of oil, there would be a local attraction of such organic matter which would in some way disturb or influence the character of the figure. In an experiment in which so much depends upon the delicacy of manipulation, would it not be better to filter and distil the water so as to ensure its purity as far as possible? I would also beg to suggest to any member who may enter on these experiments, and possess the apparatus, the employment of the oxy-hydrogen microscope—a very high power need not be used. By these means I think a series of experiments might be conducted which would result in a definite classification of cohesive figures, which could not fail to be interesting to scientific, and useful to practical society.—I am, &c., MOWBRAY WALKER.

STEEL TUBES BY COLD DRAWING.—Sir,—My attention has been called to an article in your *Journal* of the 4th instant, on the new method of producing steel and other tubes by cold drawing, which attributes to a Frenchman the introduction of this system some nine years since. I claim your indulgence, in order to correct the misapprehension to which this statement may give rise, in not distinguishing more clearly between what has been and what is now the process of manufacture. The patentees of the new machinery claim to have first applied hydraulic power to the drawing of tubes in any metal. The brass and copper tubes that have hitherto been drawn solid have been so drawn by steam power, and over a mandril the length of the tube. A method of producing tubes in which hydraulic pressure is employed was introduced some years since by a French patentee, but in this instance (the only one with which I am acquainted) a disc of metal was taken and cupped up so as to form first a saucer, then a basin, and gradually, by pressure on the bottom, a tube with one end closed; by opening this end the tube was completed. The many difficulties of this process are readily seen, and I believe it has never been made of commercial importance. By the new method eight or more hollow castings of steel, or three times as many of brass, can be drawn at once over a bulk-headed mandril, and through a die surrounding it, so as to reduce them to any degree required, improving the metal at each pass. The machine erected will draw eight 3-in. tubes in steel. The patentees claim, 1st. The machinery by which these tubes are produced and trued. 2nd. A method of cold-welding them together. 3rd. Of drawing tubes of any length over a mandril. (This has been tested to the extent of fifty feet in steel.) 4th. Of producing tapers of any size or section. The whole by cold solid drawing. There are, of course, many small details, important in their bearings on these results, but with which I will not occupy your space, as any of your readers shall have every facility afforded them for viewing the machine in operation, on applying to the Secretary of the Hydraulic Drawing Company, as below.—I am, &c., G. P. HARDING.

3, Bank-buildings, E.C.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Arts, 8. Cantor Lectures, Mr. W. Burges, "On Furniture."
R. Geographical, 8½. 1. Dr. C. Forbes, "Notes on the Physical Geography, Climate, and Mineral Resources of Vancouver's Island." 2. Lieut. Palmer, R.E., "The Upper Waters of the Fraser and Peace Rivers, with remarks on the Gold Fields of British Columbia."
British Architects, 8.
Medical.—Clinical Discussion.
R. Academy, 8. Mr. R. Westmacott, R.A., "On Sculpture."

Tues. ...Civil Engineers, 8. Mr. G. H. Phipps, "On the Resistance of Bodies passing through Water" (concluding part).
Statistical, 4. Annual Meeting.
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Prof. Marshall, "On Animal Life."

Wed. ...Meteorological, 7.
Society of Arts, 8. Mr. G. R. Burnell, "On the Organisation of the Corps Impérial des Ponts-et-Chaussées in France."
London Inst., 7.

Thur. ...Royal, 8½.
Antiquaries, 8.
Linnæan, 8. Mr. A. R. Wallace, "On Variation and Geographical Distribution, as illustrated by the *Papilionidæ*."
Chemical, 8. Sir Benjamin Brodie, "Theory of Organic Peroxides."
Philosophical Club, 6.
Numismatic, 7.
Royal Inst., 3. Prof. Marshall, "On Animal Life."

Fri. .....Philological, 8.
Royal Inst., 8. Prof. Tyndall, "Contributions to Molecular Physics."
R. United Service Inst., 3. Lieut.-Col. A. C. Robertson, "The Art of Command considered with reference to the duties of Regimental Officers."

Sat. ....Royal Inst., 3. Prof. Frankland, "On the Metallic Elements."

PARLIAMENTARY REPORTS.

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SESSIONAL PRINTED PAPERS.

Par.
Numb.

Delivered on 20th and 22nd February, 1864.

49 (1). Navy (Labour Charts for Dockyards and Steam Factories)—Return.
59. General Committee of Elections—Mr. Speaker's Warrant.
36. Convicts—Return.
43. East India (Loan)—Return.
44. East India (Revenues)—Return.
51. Railway Trains (Redhill)—Returns.
52. Casual Poor (Metropolis)—Return.
53. Bank of England - Annual Accounts.
19. Railway and Canal, &c., Bills (13. London, Brighton, and South Coast Railway (Additional Powers), New Lines in Battersea); 14. London, Chatham, and Dover Railway (No. 1); 15. London, Chatham, and Dover Railway (No. 2), (New Lines, &c.); 16. London Main Trunk Underground Railway; 17. London Union Railways; 18. Metropolitan and Saint John's Wood Railway; 19. Metropolitan District Railways; 20. Metropolitan Grand Union Railway; 21. Metropolitan Railway (Additional Powers), (Notting-hill and Brompton Extension), (Trinity-square Extension); 22. Midland Railway (Saint Pancras Branch); 23. North London Railway (Additional Powers), (Kingsland and Tottenham Line); 25. Tottenham and Farringdon-street Railway; 26. Tottenham and Hampstead Junction Railway (Extension to Charing-cross); 27. Victoria Station and Thames Embankment Railway; 28. Walthamstow, Clapton, and City Railway)—Board of Trade Reports.
23. Bills—Penal Servitude Acts Amendment.
27. ,, Cattle Diseases Prevention.
28. ,, Cattle, &c., Importation.

Session 1863.

Delivered on 19th February.

Census of Ireland for the Year 1861—Report and Tables, Vol. 1. (Part 4).

Delivered on 23rd February, 1864.

45. Army (1862-63)—Statement of Savings and Deficiencies.
66. Trade and Navigation Accounts (31st December, 1863).
19. Railway and Canal, &c., Bills (24. Oxford-street and City Railway; 29. Aberystwith and Welsh Coast Railway; 30. Alford and Mablethorpe Railway; Alton, Alresford, and Winchester Railway; 31. Anglesea Central Railway; 32. Aylesbury and Buckingham Railway; 33. Bedford and Cambridge Railway; 34. Belfast and Northern Counties Railway; Belfast, Ballymoney, and Ballycastle Junction Railway; 35. Blackpool and Fleetwood Railway; Blockley and Banbury Railway; 36. Blyth and Tyne Railway (Additional Powers) (New Works); 37. Bourton on the Water Railway)—Board of Trade Reports.
25. Bills—Land Drainage (Provisional Orders).
26. ,, Inclosure.
Convict Discipline and Transportation—Further Papers.

Delivered on 24th February, 1864.

8. Irish Reproductive Loan Fund—Account.
22. Telegraphs (India, Singapore, and Australia)—Return.
25. Court of Chancery—Return.
58. Bullion—Return.
63. Augmentation of Benefices—Return.
64. Theatres (Precautions against Fire)—Return.
71. Bullion—Return.

Patents.

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From Commissioners of Patents Journal, March 4th.

Grants of Provisional Protection.

Artificial fuel, cylinders used in the manufacture of—390—H. W. Wood.
Bacon, manufacture of—361—A. and E. M. Denny.
Boots, shoes, &c., manufacture of—362—J. Keats and W. S. Clark.
Boots, shoes, &c., uniting the soles and uppers of—368—T. White.
Braiding machines—380—T. Jackson.
Bread making, superphosphates for—360—J. H. Johnson.
Brewing utensils—322—W. R. Taylor.
Buildings, &c., fire-proof—376—W. Riddle.
Cement, manufacture of—414—H. Y. D. Scott.
Chandeliers, lamps, &c., manufacture of—104—J. Rennie.
Cranks, apparatus for forging, &c.—356—R. Smith.
Doors, &c., rendering water tight—395—W. C. Fuller.
Envelopes, letters, &c., fastening and securing—2704—J. H. Brown.
Fabrics, apparatus for tentering, &c.—382—W. Whiteley.
Fibrous materials, machinery for preparing, &c.—384—W. Anderton.
Filters—364—J. Slack.
Garments, &c., attaching buttons to—394—H. and J. Andrews.
Gas purifiers, hydraulic valves for—156—J. Wilson.
Grain, apparatus for drying—374—W. Southam.
Hydraulic presses, pumps of—412—W. Hawkins.
Iron, manufacture of—372—W. Drake.
Land, apparatus for cultivating—392—W. Hensman.
Parasols, &c.—410—J. Weeks.
Photographic apparatus—363—P. A. L. de Fontainemoreau.
Power-looms—378—W. Norton.
Railway signal—405—W. Hobbs.
Railways, permanent way of—398—W. Clark.
Smoke, apparatus for consuming—195—R. A. and E. Wright.
Steam apparatus for ships' use, &c.—370—W. Winstanley and J. Kelly.
Steam engines—400—A. J. Joyce.
Sulphuric acid, manufacture of—358—G. Davies.
Threshing machines—366—J. David.
Windows, apparatus for cleaning—396—J. E. Tuchet.

Inventions with Complete Specifications Filed.

Artificial granite, &c., manufacture of—488—W. E. Gedge.
Spine-bags—504—J. Chapman.

Patents Sealed.

2202. S. Gerish and J. Weston.
2203. L. Mond.
2206. W. A. Wilson and J. Smith.
2207. J. Burch.
2209. R. A. Brooman.
2210. W. Hewitt.
2220. E. T. Hughes.
2229. J. H. Wilson.
2231. W. W. Greener.
244. H. Crichley.
2251. D. S. Sutherland.
2253. H. Riviere.
2282 P. Cowan.
2367. G. Spill, T. J. Briggs, and D. Spill.
2447. A. Johnston.
2256. H. Clayton.
2892. E. C. Nicholson.
3066. W. Firth, S. Firth, and J. Sturgeon.

From Commissioners of Patents Journal, March 8th.

Patents Sealed.

2232. H. Wright, J. W. Wright, and . Clough.
2236. J. Hartshorn & W. Redgate.
2238. L. Desens.
2240. J. Rhodes.
2242. J. Dobbie.
2246. J. Crellin.
2247. J. King.
2260. C. Battock.
2262. W. Thompson.
2272. B. J. Webber.
2380. J. T. and E. Harlow.
2450. E. Leek.
2504. G. Mountford.
2651. T. Grason.
2746. H. Bessemer.

Patents on which the Stamp Duty of £50 has been Paid.

526. G. Smith and J. Carrick.
534. T. Haigh and R. A. Robertson.
541. S. Botturi.
543. E. Sabel.
572. G. Eskholme.
569. H. A. Silver and H. Griffin.
579. T. W. Evans.
604. J. Hirst, jun., and J. Hollingworth.

Patents on which the Stamp Duty of £100 has been paid.

667. C. Lungley.
729. H. Bridges.
730. J. P. Oates.
824. S. Fox.
663. R. M. Ordish.